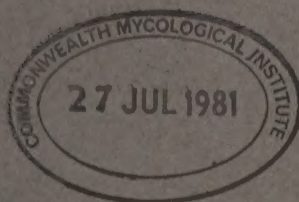


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REPUBLIEK VAN SUID-AFRIKA
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LANDBOUNAVORSING
AGRICULTURAL RESEARCH
1980



**REPUBLIEK VAN SUID-AFRIKA
REPUBLIC OF SOUTH AFRICA**

**Departement van Landbou-tegniese Dienste
Department of Agricultural Technical Services**

LANDBOUNAVORSING AGRICULTURAL RESEARCH 1980

**Redakteur } D.P. le Roux
Editor }**

AGRICULTURAL RESEARCH 1.7.1979 - 31.3.1980

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Note: The Department issues a separate list of research workers and lecturing staff, which is obtainable on request from the Director of Agricultural Information, Private Bag X144, Pretoria

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* Publisher

SLEUTEL TOT PROJEKTEREËKS**KEY TO PROJECT SERIES****AFDELINGS**

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 (A)LBN : Landbou-bemarkingsnavorsing
 (A)LPE : Landbouproduksie-ekonomie

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(A)I : Plantbeskerming (Insektekunde)
 (A)PS : Plantbeskerming (Patologie)
 (A)P : Plantkunde
 (A)S : Grond en Besproeiing
 (A)T : Tuinbou
 (A)VS : Vee- en Suiwelkunde
 A.W. : Akkerbou en Weiding
 KG : Kleingraansentrum
 OP : Veeartsenykundige Navorsing
 SG : Somergraansentrum
 (S)N : Sitrus en Subtropiese Vrugte
 (S)T : Tabak
 (S)WI : Wynkunde en Wingerdbou
 (S)WP : Vrugte en Vrugtetegnologie

STREKE

H : Hoëveld
 K : Karoo
 N : Natal
 O : Oranje-Vrystaat
 OK : Oos-Kaap
 T : Transvaal
 W : Winterreën
 SW : Suidwes-Afrika Landboustreek

DIVISIONS

(A)L-MI : Agricultural Engineering
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 (A)VS : Animal and Dairy Science
 A.W. : Crops and Pastures
 KG : Small Grain Centre
 OP : Veterinary Research
 SG : Summer Grain Centre
 (S)N : Citrus and Subtropical Fruit
 (S)T : Tobacco
 (S)WI : Oenology and Viticulture
 (S)WP : Fruit and Fruit Technology

REGIONS

H : Highveld
 K : Karoo
 N : Natal
 O : Orange Free State
 OK : Eastern Cape
 T : Transvaal
 W : Winter Rainfall
 SW : South West Africa Agricultural Region

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Ad : Addo	Kf : Koopmansfontein	Ps : Potchefstroom
Av : Armoedsvlakte	Kh : Kalahari	Rd : Rietondale
BD : Bien Donné	Kn : Carnarvon	Rp : Roodeplaat
Bf : Bloemfontein	Ko : Kokstad	Sb : Stellenbosch
Bh : Bathurst	Ks : Kaapstad/Cape Town	Sp : Sonop
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(K) na projeknommer dui koöperatiewe projek aan
 (K) after project number indicates co-operative project

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PLANT PRODUCTION

AGRONOMY

Small Grain

WHEAT

CULTIVARS

N-Dd.8/1:

WHEAT PRODUCTION IN NATAL: INTRODUCTION AND
EVALUATION OF WHEAT CULTIVARS FOR DRYLAND
PRODUCTION IN NORTHERN NATAL. 1972-1979
F.P.C. Blamey and W.R.M.E. Pieper

Trials carried out on an Avalon soil at Dundee Agricultural Research Station over a number of seasons have shown that dryland wheat has a reasonable potential in Northern Natal. Four seasons' results have shown the best planting time to be the month of June. Planting earlier than this can result in early ear formation and damage by frost in August or September. Later planting, in July or August, results in poor stooling and ear-filling in a hot time of the year. Yields are generally very poor with August-planted wheat.

For June plantings, 30-40 kg of seed per hectare should be drilled with a press-wheel planter. Consistently good yields have been obtained from wheat planted in June. The best commercial cultivars and mean grain yields over four seasons are given in Table 1.

TABLE 1 - Mean grain yields of seven commercial wheat cultivars at Dundee (June planting)

Cultivar	Grade	Yield (kg/ha)
Bella	B	2 511
K20	A	2 452
Kenia Sokkies	B	2 336
Frisko	B	2 243
Barta	A	2 179
Betana	B	2 091
Betta	A	1 809

In order to obtain these yields, the soil was ploughed or deep-ripped in late December to ensure that all rainfall entered the soil. Weeds were controlled by shallow working of the soil until April. Thereafter the soil was not disturbed as cultivation would have resulted in drying-out of the topsoil.

The choice of the correct cultivar for the area is very important for high yields. For example, Sheepers 69, which is grown widely in the Orange Free State, grows poorly at Dundee, the grain yield being only one third of the yields of the well-adapted cultivars. This is because the winters are too warm for Sheepers 69, which has a high cold requirement.

Factors increasing the risk of dryland wheat production over that of summer crops were as follows: Poor rainfall during autumn (the time of moisture storage in the soil) and/or early spring, the time when the wheat is heading;

Unseasonally high temperatures during August followed by frost in September;

The high incidence of hail in September and October.

Publication

Blamey, F.P.C., 1974. Dryland wheat for Northern Natal. *Natal Region Newsletter*. Dec. 1974

Protein and Oil-rich Seeds

DRY BEANS

PRODUCTION

H-Ps.249/1:

PRODUCTION POTENTIAL OF DRY BEANS IN THE HIGHVELD REGION: YIELD AND QUALITY OF DRY BEANS ON A SOETMELK SOIL (120 cm) IN THE EASTERN FREE STATE. 1973-1976
C.J. Swanevelder

The project was carried out at the Bethlehem Agricultural Research Station where five dry bean types (Kidney, Small White Haricot, Komati, Michigan and Coffee) were planted at two different planting dates, determined by adequate rainfall.

The yield obtained and protein content of the seed are presented in Tables 1 and 2. Results indicate that the cultivar Michigan is not suited to this area.

TABLE 1 - Seed production in kg/ha

Cultivar	1973/74		Season 1974/75		1975/76	
	27/11/73	3/1/74	13/11/74	18/12/74	22/10/75	2/12/75
Kidney	388	455	3 808	1 854	3 034	2 153
Coffee	1 297	979	1 553	1 488	1 224	929
Small White Haricot	1 128	327	1 003	636	1 000	678
Komati	1 609	583	985	1 044	966	942
Michigan	612	292	765	421	357	527
Mean	1 007	528	1 623	1 089	1 316	1 046
LSD: Cultivars (V)	243,5		260,6		512	
LSD: Planting dates (D)	413,5		385,5		-	
LSD: VXD	(1) 344,5 (2) 145,3		(1) 340,3 (2) 358,7		-	

(1) Cultivars at same planting date

(2) Cultivars at different planting dates

TABLE 2 - Percentage protein content of the different cultivars

Cultivar	1973/74	1974/75	Season	
			22/10/75	2/12/75
Coffee	24,4	24,4	21,1	18,6
Michigan	22,8	22,9	22,6	21,8
Komati	20,25	20,1	19,1	18,2
Small White Haricot	22,6	20,4	20,1	18,1
Kidney	20,0	20,0	18,9	19,1

SOYBEANS

PRODUCTION

H-Ps.248/1:

PRODUCTION POTENTIAL OF SOYBEANS IN THE HIGHVELD REGION: YIELD AND QUALITY OF SOYBEANS ON A SOETMELK SOIL (120+cm) IN THE EASTERN FREE STATE. 1973-1976
C.J. Swanevelder

The aim of this project was to determine the production potential of soybeans on a high-potential soil. The project was carried out for three seasons at the Bethlehem Agricultural Research Station where

Summaries

SUNFLOWER

five cultivars (Geduld, Voorspoed, Rhosa, Welkom and Masterpiece) were planted at two planting dates, determined by adequate rainfall.

Good yields were obtained during 1975/76 (Table 1). The late plantings were killed by frost during 1973/74 and 1974/75. It seems as if the end of November is the latest possible date for the successful planting of these cultivars in this area. Germination problems with Rhosa during the first seasons led to very poor plant populations.

TABLE 1 - Seed production in kg/ha

Cultivar	Season			
	1973/74 Early	1974/75 Early	1975/76 Early	1975/76 Late
Masterpiece	1 231	1 425	1 829	1 632
Welkom	1 606	921	1 683	1 216
Geduld	1 091	143	1 098	527
Voorspoed	1 088	422	1 283	475
Rhosa	-	57	1 771	1 407
Mean	1 254	593	1 533	1 051
LSD:Cultivars:	260	187	271	
Planting dates:	-	-	244	

The protein content of the different cultivars was also determined and is represented in Table 2.

TABLE 2 - Protein content (%) of the different cultivars

Cultivar	Season			
	1973/74 Early	1974/75 Early	1975/76 Early	1975/76 Late
Voorspoed	35,8	35,6	35,9	38,5
Geduld	37,8	35,9	34,3	36,9
Welkom	35,6	35,6	35,3	35,3
Rhosa	-	34,8	34,8	34,8
Masterpiece	33,1	32,9	33,8	35,3

SUNFLOWER

FERTILIZER

N-Dd.10/4:

SUNFLOWER PRODUCTION IN THE NATAL REGION: BORON
NUTRITION OF SUNFLOWERS ON A DOVETON CLAY LOAM.
1976-1979

F.P.C. Blamey and J. Chapman

Marked response of sunflowers (*Helianthus annuus* L.) to boron fertilization has been recorded, but little information exists on the boron requirements of this crop. Field trials were therefore conducted in which five rates of B fertilizers (0 to 4 kg B/ha) were applied to two cultivars, Smena and SO320, on two soil types. The cultivars differed in visual susceptibility to B deficiency in the vegetative stage but differed only slightly in B uptake. B fertilization increased seed yields by an average of 48 % in both cultivars. To establish critical B concentrations in plant tissues, relationships were investigated between seed yield and the B concentrations in 1-month-old seedlings and in the topmost mature leaf at flowering. Seedlings proved unsatisfactory as index tissue, particularly with SO320, but meaningful relationships were recorded between seed yield and B concentration in the topmost mature leaf at flowering in both cultivars. Critical concentrations in this tissue were determined as 32 and 35ppm B for Smena and SO320 respectively. No significant differences were recorded between the two cultivars in the relationship between seed yield and B concentration in the leaf below the critical levels, and the data were therefore combined. The critical concentration in the topmost mature leaf at flowering was determined as 34ppm B for both cultivars, the confidence interval (95 %) being from 31 to 38ppm B.

Publications

- Blamey, F.P.C. & Mould, D., 1979. Evaluation of response functions for establishing the critical boron concentration in sunflower leaf tissue. *Crop Prod.* 8. (In Press)
- Blamey, F.P.C., Chapman, J. & Mould, D., 1978. Variation between sunflower cultivars in uptake of native and applied boron on a Doveton soil. *Crop Prod.* 7, 79-83
- Blamey, F.P.C., Mould, D. & Chapman, J., 1979. Critical boron concentrations in plant tissues of two sunflower cultivars. *Agron. J.* 71, 243-247

Other Agronomic Crops

LUCERNE

FERTILIZER

- OK-Do.62/8: MINERAL NUTRITION OF LUCERNE: EFFECT OF ISCOR OPEN-HEARTH SLAG COMPARED WITH CALCIUM CARBONATE, ON SOIL pH AND PHOSPHORUS UPTAKE BY LUCERNE. (POT EXPERIMENT). 1973-1976
R.B.A. Harry

Iscor open-hearth slag supplied by Iscor, and slag ground to pass through a 250-micrometre sieve were compared in a pot experiment with calcium carbonate as ameliorant for an acid sandy loam topsoil occurring at Dohne in the Eastern Cape. Lucerne was the test crop, and treatment levels of 0; 1,5; 3; 6 and 12 tons/ha were used.

The results showed that slag was inferior to calcium carbonate as an ameliorant although grinding the slag improved its effectiveness. It was concluded that the use of slag in the Eastern Cape could not be warranted in view of the high cost of transport and milling, and the ready availability of lime in the area.

POTATOES

FERTILIZER

- O-Gl.117/10: NITROGEN AND POTASSIUM FERTILIZATION OF POTATOES AT VARIOUS IRRIGATION LEVELS. 1977-1979
G.S. Cloete and H.L.J. Potgieter

The object of this experiment was to determine the effect of different nitrogen and potassium levels on potatoes when irrigated at different levels. The trial was carried out on a red sandy soil of the Hutton form and Shorrocks series at Glen College of Agriculture. A 4 x 3 x 4 factorial experiment with four replications was run in 1977 while in 1978 and 1979 the experiment was designed as a 3 x 3 x 3 factorial in randomized blocks.

The levels of the different treatments tested in 1977 and 1978-1979 are given in Table 1.

The potatoes, cultivar Up-to-Date, were planted in soil at field capacity during the second half of January. A broadcast application of superphosphate (8,3%P) at a level of 90 kg P per hectare was ploughed in before planting, while nitrogen and potassium were banded at planting. These quantities are subsequently given in this report.

The tuber yield was divided into four classes according to the following sizes: 0-30 g; 30-60 g; 60-200 g and tubers larger than 200 g. Statistical analyses were carried out on the mass and number of tubers in each class as well as the total yield. Long term analyses were carried out on the results of the seasons 1977-1979 as well as those of the seasons 1978-1979.

Increased levels of irrigation resulted in increased tuber mass in each class as well as total yield. The two higher levels of irrigation also resulted in larger numbers of tubers than the lowest level.

Application of 200 and 300 kg N per ha resulted in higher total tuber mass than 100 kg N per ha, while in 1978-1979 the lowest level of 100 kg N per ha resulted in a larger total number of tubers per ha in comparison with 200 and 300 kg N per ha. Mass and number of tubers in the class 0-60 g were increased

TABLE 1 - Levels of irrigation, nitrogen and potassium fertilization tested in an experiment with potatoes at Glen (1977-1979)

Year	Level	1977 mm evaporation	1978-1979 mm evaporation
Irrigation levels (I)** (mm evaporation at which irrigation is applied)	1	40	40
	2	70	70
	3	100	100
	4	130	-
Nitrogen levels (N)	Level	kg N/ha	kg N/ha
	0	0	-
	1	100	100
	2	200	200
Potassium levels (K)	3	-	300
	Level	kg K/ha	kg K/ha
	1	0	0
	2	150	150
	3	300	300
	4	450	-

** Flood irrigation of 60 mm each was applied between the planting hills from tuber initiation stage every time when the given quantity of water had evaporated from an American class A pan

at a level of 100 kg N per ha compared with 300 kg N per ha. The two highest levels of N resulted in a higher mass and larger numbers of tubers larger than 200 g compared with the lowest N level.

Applications of potassium at levels of 150 and 300 kg per ha resulted in increased mass and numbers only of tubers larger than 200 g in comparison with 0 kg potassium per ha.

Chemical analyses were carried out on the foliage one month after planting and on the tubers after harvesting. The N treatments of 200 and 300 kg per ha resulted in higher percentages of N in the foliage and tubers in comparison with 100 kg N per ha. In addition, it was found that the lowest level of irrigation resulted in a higher percentage of N in the tubers than the highest level of irrigation. Potassium treatments of 150 and 300 kg per ha resulted in higher percentages of K in the foliage than 0 kg K per ha. Treatments of nitrogen at levels of 200 and 300 kg per ha had a suppressive effect on percentage of Ca in the foliage in comparison with 100 kg N per ha. Potassium treatments at levels of 150 and 300 kg per ha resulted in lower percentages of Mg in the foliage compared to 0 kg K per ha.

VIRUS DISEASES

T-Rp.20/11:

EFFECT OF PLANTING TIME ON THE INCIDENCE OF VIRUS DISEASES OF POTATOES IN THE DOUGLAS AREA. 1978-1979 T.C. Botha

This co-operative experiment was conducted at Douglas on irrigated potatoes. The influence of planting time, removal of the foliage as soon as optimum production of seed potatoes was obtained and aphid control on the occurrence of viruses in the plants were determined.

Potatoes planted as early as December had an uneconomical low yield. Viruses occurred on only two of the 16 experimental plots. However, the number of infested plants per plot were still within limits and therefore both plots still qualified for the production of AA seed potatoes. To qualify for the production of AA seed potatoes, the number of plants per land that are infested with leaf roll and/or mosaic viruses, is not allowed to exceed 2%. It is clear that no conclusion can be drawn as far as the influence of the above-mentioned treatments on the occurrence of viruses was concerned.

SISAL

PRODUCTION

N-Ce.86/1:

SISAL PRODUCTION IN THE NATAL REGION: THE EFFECT OF
SEVERITY, REGULARITY AND STAGE OF COMMENCEMENT OF
CUTTING ON THE YIELD OF SISAL. 1963-1972
R.D. Mould

This project, which was initiated in 1964 on the estate of the First S.A. Cordage Company at Hluhluwe, represents the only research on the cutting of sisal carried out in South Africa. Prior to the results of this experiment becoming available to sisal growers, cutting methods were based on the sisal research carried out by Lock (1962) in Tanzania. He showed that cutting methods are important in the successful production of this perennial crop. However, differences in climate and soil type between Tanzania and the arid regions of Natal and Zululand, where the majority of sisal is grown, necessitated experimentation under local conditions.

The ability of the sisal plant to compensate for various extremes in cutting procedure, in the long term, is well illustrated in this eight-year experiment. Large differences in fibre yield and fibre percentage between treatments occurred at various stages during the growth of the crop, but the differences tended to converge as the plants matured. Nevertheless, overall significant differences in total accumulated fibre yield did occur between treatments and are discussed briefly below.

Generally, the larger the interval between cuts (6, 12 and 18 months), the more severe the cutting (leaving 8, 16 and 24 uncut leaves) that the plant can tolerate without adverse effect on production. The reverse is also true in that excellent response to light cutting every 6 months was obtained although it is doubtful whether such a cutting system would be economically feasible. Of greater practical significance is the equally good and consistent response, over the duration of the experiment, to (a) severe cutting every 12 months commencing 36 months after planting (21,0 t/ha accumulated dry fibre), and (b) moderate cutting every 12 months commencing 30 months after planting (21,87 t/ha). It is interesting to note that equally good dry-fibre accumulations can be achieved at all three levels of cutting severity provided cuttings are combined with a suitable time interval between cuts and suitable commencement time.

For the producer the decision as to which of the above treatment combinations to adopt will depend ultimately on the most convenient and economically feasible cutting system.

Lock (1962) found that any delay in the commencement of cutting results in the reduction of fibre yield irrespective of the cutting system used. Within the limits of the three commencement times used in this experiment (30, 36 and 42 months after planting) considerably different trends were observed. Early commencement of cutting resulted in a lower rate of fibre bulking for most of the life of the plant, but this improved markedly during the last two years of the experiment. On the other hand, late commencement of cutting resulted in a high rate of fibre production during the first four years of growth. However, this decreased steadily thereafter with final accumulated fibre yield being considerably lower than the other two treatments. The intermediate commencement time (36 months after planting) appears to be the most reliable with a relatively constant rate of fibre production throughout the life of the plant.

As far as fibre percentage is concerned, the 12 month interval between cuts and the moderate and severe cutting intensities produced the most consistently high fibre percentage (mean 3,65%) over the duration of the experiment. However, differences between treatments were generally small, especially in the latter half of the plant's life. It is encouraging, though, that the high yielding cutting system of practical value (i.e. (a) heavy cutting every 12 months commencing 36 months after planting, and (b) moderate cutting every 12 months commencing 12 months after planting) also produced the highest percentage.

Irregular fluctuations in demand for sisal fibre over the years have made long term production extremely difficult. Fortunately the ability of the sisal plant to tolerate wide variation considerably in cutting systems without serious adverse effects on dry fibre yield and extraction percentage is to the benefit of sisal growers who can adapt to current demand fluctuations. The grower can thus manipulate his cutting system to increase or decrease production in the short term without seriously affecting accumulated fibre yield in the long term.

Reference

Lock, C.W., 1962. Sisal. Longmans, Green and Co. Ltd.

N-Ce.86/2:

SISAL PRODUCTION IN THE NATAL REGION. 1966-1978

R.D. Mould

Population density is considered to be the major limiting factor determining fibre yield in sisal production. Trials in Kenya and Tanzania revealed that high populations do not necessarily denote high yield if the land is low in nutrients. Responses to heavy nitrogen and calcium applications on third-cycle sisal lands resulted in a 49 % increase in fibre yield in Tanzania.

As virtually no authoritative information was available on plant density and nutrient requirements in South Africa, an experiment was initiated in 1966 at Hluhluwe on second-cycle sisal lands to establish these requirements for the Zululand sisal-growing areas. Soil type: Shortland series. Rainfall: 600 mm.

The experiment consisted of three populations, viz. S2-4 000, S1-5 000 and S0-6 000 plants/ha. An extremely favourable response in fibre yield to increasing populations was obtained: Where plant densities were increased from 4 000 to 5 000 plants/ha, an increase in fibre yield of 1,7 tons/ha resulted, representing an 11 % rise in fibre production. Increasing plant densities to 6 000 plants/ha resulted in a further 2 tons/ha rise in fibre yield, representing a 23 % increase compared with the lowest plant population (Fig. 1).

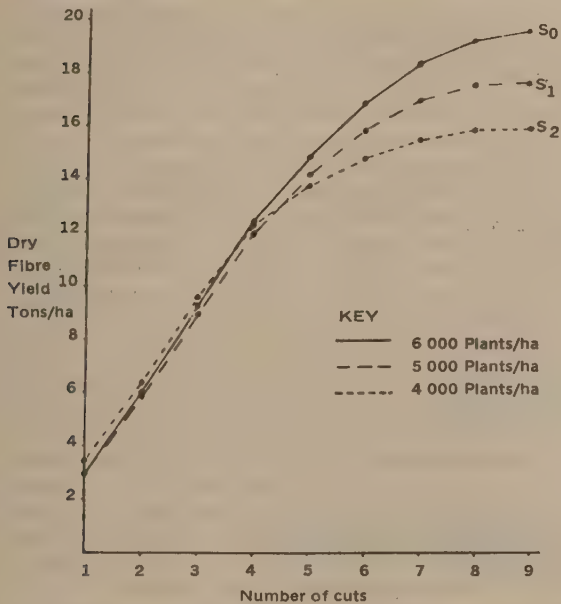


FIG. 1 - Response in accumulated dry-fibre yield of sisal to three population densities at 12-month cutting intervals

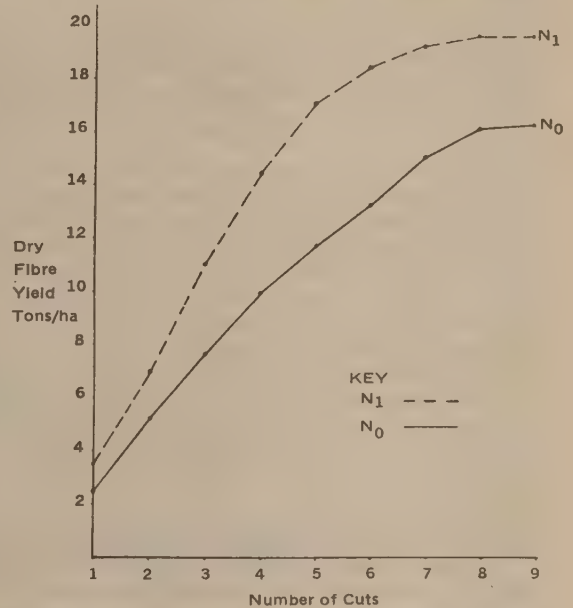


FIG. 2 - Effect of application of 160 kg/ha nitrogen on sisal accumulated dry-fibre yield

At the present-day value of R530/ton for No. 3-grade fibre, the increase of 3,7 tons/ha for the highest population, compared with the lowest, represents a gain of approximately R1 950/ha or R195/ha p.a.

Annual applications of 160 kg/ha nitrogen as urea, increased fibre production by 3 tons/ha over all populations. Furthermore, N accelerated senescence which occurred after 6 to 7 cuts, compared with 8 to 9 cuts in the absence of N (Fig. 2).

In the absence of all other nutrients, nitrogen, at 6 000 plants/ha, increased yield by 5,9 tons/ha. Due to the non-replicated factorial design, this response did not emerge significantly. At the prevailing price of R250/ton for urea (46 % N), fertilizer costs would be R870. After deducting this, returns on No. 3-grade fibre at R530/ton could be increased by R250/ha over ten years.

Applications of 160 kg/ha phosphorus had a particularly depressive effect at the lowest population level, reducing fibre yield by 2,8 tons/ha.

With regard to potassium and calcium, no clear response was discernible.

Fertilization had very little effect on percentage fibre extracted. Applications of N and K increased this percentage marginally while Ca had a depressive effect. There was an increase in fibre percentage at the two higher populations, compared with the lowest population.

Both fertilization and population had a minimal effect on the number of leaves produced per plant. The rate of leaf production varied considerably, however. Treatments having low populations and

receiving N senesced first at the fifth and sixth cuts, followed by intermediate populations fertilised with N, at the seventh cut. The only plants that survived the ninth cut were those that had not been fertilized with N.

Application of 160 kg N/ha at 6 000 plants/ha increased yields by 7,1 tons/ha compared with 4 000 plants/ha receiving no N, as commonly practised in commercial production. This response represents a possible increase in returns of R2 900/ha or R290/ha p.a. (Fig. 3).

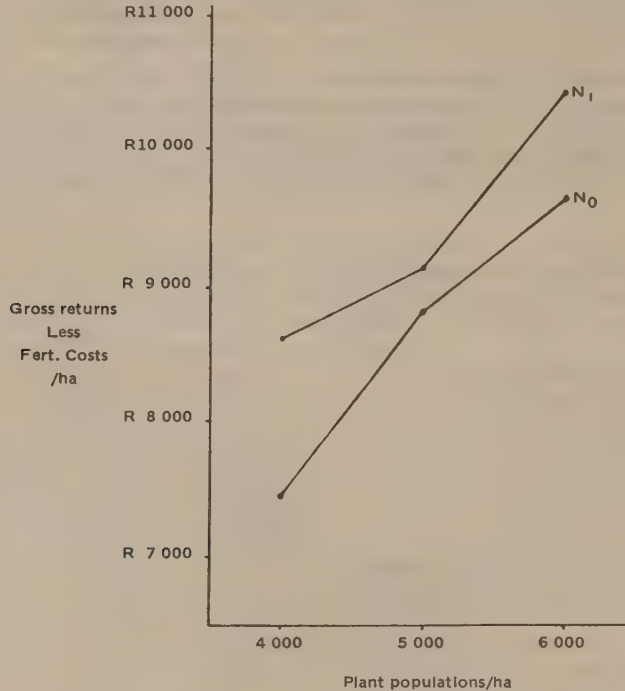


FIG. 3 - The effect of plant population densities and nitrogen applications (@160 kg/ha) on gross returns of sisal accumulated dry-fibre yield, over 10 years

Recent petrochemical price increases have caused a marked swing back to natural fibres. The favourable impact this has had on the sisal price structure now makes nitrogenous fertilization economically feasible.

Overall soil tests carried out at the site of the experiment prior to establishment indicated a high initial level of potassium, viz. ± 100 p.p.m. Unfortunately there is no record of phosphate levels. pH varied from 3,9 to 4,6.

At the termination of the project nearly all the potassium levels had increased to more than 300 p.p.m. even on control plots. This is probably the result of animals grazing between the sisal rows. Phosphate levels averaged 14,2 p.p.m. on control plots and more than 50 p.p.m. on plots receiving phosphate. pH ranged from 4,6 to 5,4.

TOBACCO

DISEASES

(S)T.309/1:

STUDY OF THE BIOLOGY AND CONTROL OF BROWN-SPOT DISEASE OF TOBACCO : INFECTION TECHNIQUES. 1970-1978
R.J. van Wyk

Infection studies with the fungus *Alternaria alternata* which causes brown-spot of tobacco, have been largely field-orientated because laboratory methods for producing and evaluating brown-spot were

cumbersome and erratic. It is known that erratic results with artificial inoculation can be caused by several factors such as slightly virulent or avirulent isolates or unsuitable climatic conditions. A suitable and repeatable infection technique is of the utmost importance if breeding lines have to be screened for resistance against any disease.

Several inoculation experiments were carried out in which techniques used with success by other research workers, were closely adhered to, but with poor results. Many isolates were used throughout these experiments and it was only after introducing Coker 298, from the USA, as a test plant that good results were obtained. It was concluded that local cultivars are fairly resistant to brown-spot infection and that although virulent isolates of brown-spot do exist in South Africa, they are in the minority.

FERTILIZER

(S)T.20/11:

NUTRITION OF TOBACCO IN THE REPUBLIC OF SOUTH AFRICA: THE INFLUENCE OF TIME OF NITROGEN APPLICATION.

1971-1974

J.J. du Toit, J.G.K. Coetzee and F.J. Shawe

The influence of the time of nitrogen application on the yield of the flue-cured tobacco cultivar 70A22 was studied in a field experiment at Rustenburg on the Arcadia soil series during the 1971/72, 1972/73 and 1973/74 seasons. Two levels of nitrogen, namely 42 and 84 kg N/ha as limestone ammonium nitrate (LAN) 26 %, were applied in different ratio combinations as topdressings at 0,3 and 5 weeks after planting. During the 1974/75 season a similar experiment with topdressings of 30, 60 and 90 kg N/ha at 0,3 and 6 weeks after planting was conducted at Nelspruit.

On the Arcadia series the influence of the time of nitrogen application on yield differed from season to season. In the 1971/72 season the highest yield was obtained with late applications of nitrogen, in the following season with early applications, and there were no differences between early and late applications during the last season. These differences were due to the different rainfall patterns experienced during the respective seasons. During the 1971/72 season the rainfall was relatively high and well distributed over the whole season, so that leaching could be responsible for the effect obtained with late applications. The 1972/73 season was relatively dry throughout the season. Flood irrigation caused soil compaction with the result that water and gas infiltration during the latter part of the growth season were repressed and this restricted the utilisation of the late applications. During the 1973/74 season the rainfall was about average and well distributed over the season. Early and late applications were effectively utilised and because leaching was minimal, there was no difference between the two levels of application.

On the Arcadia series more than 50 % of the nitrogen requirement of tobacco is supplied by the organic fraction of the soil. The supply of nitrogen from this source is dependent on the soil moisture content, temperature and oxygen supply, i.e. on the climatic conditions. No definite fertilisation programme can therefore be given. The present practice where the major part of the nitrogen is applied prior to planting and supplemented by top-dressings according to the climatic conditions, the development of the plants, and to the farmer's experience and knowledge of the soil, is still the most reliable method.

The experiment at Nelspruit led to more or less the same conclusion as very little difference in yield was found between the different treatments. There were, however, indications that at the relatively low application of 30 kg N/ha, a higher yield was obtained where the top-dressings were spread over the growth season. At the higher application rate of 60 kg N/ha the time of application had no significant effect.

(S)T.20/13:

NUTRITION OF TOBACCO IN THE REPUBLIC OF SOUTH AFRICA: THE SENSITIVITY OF TOBACCO TO ALUMINIUM TOXICITY.

1973-1974

J.J. du Toit, J.G.K. Coetzee and F.J. Shawe

The influence of aluminium concentration on tobacco was studied in a water culture with plants of the flue-cured cultivar 70A22. It was shown that tobacco is relatively sensitive to aluminium in the nutrient solution. A concentration of 0,1 mg/l Al reduced the leaf mass by 32 % and the root mass by 16 %.

In a pot experiment the possibility of aluminium toxicity in the subsoil of a Clovelly soil from Vaalwater was investigated. The profile was sampled in 120x50 mm layers to a depth of 600 mm. Calcium carbonate at rates equivalent to 800, 4000 and 8000 kg/ha was applied. Corresponding rates of calcium sulphate and sodium carbonate on the basis of their calcium and carbonate content respectively were also applied.

Soil analysis of the treated soil layers showed that the clay content gradually increased with depth. Calcium carbonate and sodium carbonate raised the pH of all the layers, while calcium sulphate caused a

slight drop in pH. Application of 8 000 kg calcium carbonate per hectare increased the exchangeable calcium content by an average of 2,83 me Ca/100 g over the whole profile, while the highest levels of calcium sulphate and sodium carbonate caused increases of 0,92 to 1,25 and of 0,92 to 1,02 me Ca/100 g respectively. Increasing applications of calcium carbonate and sodium carbonate effectively reduced the exchangeable aluminium content, while the application of calcium sulphate caused an increase in the exchangeable aluminium content.

Application of calcium carbonate and calcium sulphate in the topsoil (0-400 mm) caused a slight increase in the yield of tobacco leaves, while the higher rates of sodium carbonate reduced the yield. In the subsoil (400-600 mm) where the pH was very low (pH in water = 4,0), the application of calcium carbonate and calcium sulphate increased the yield by 100 % and 50 % respectively, while only the lowest rate of sodium carbonate showed a noticeable increase in yield.

These results indicate that the application of lime on very acid soils will have a significant effect on tobacco yields only if the lime can be incorporated into the subsoil, but this is at present not economically feasible.

INSECT PESTS

- (S)T.210/1: THE AMERICAN BOLLWORM - BIOLOGY AND CONTROL OF THE PEST ON TOBACCO: ESTABLISHMENT OF A BOLLWORM MASS-CULTURE. 1976-1978
E.G. Eulitz, R.J. van Wyk

The purpose of this study was to find a method for the control of an *Aspergillus* spp. fungal contamination in the bollworm culture tubes which inhibited the mass culture of bollworm larvae on Shorey rearing medium.

It was found that the fungal contamination originated in the dried beans used in the medium, the cottonwool plugs and the newly hatched bollworm larvae in an unsterile laboratory. It was determined that the larvae, unsterile laboratory and the rearing medium were responsible for 4, 33 and 63 % of the fungal contamination respectively.

Methyl -p-hydroxybenzoate, a fungal inhibitor and part of the medium controlled the fungus only in the absence of the bollworm larvae.

A general sanitation program of autoclaving the beans, wheatgerm, cottonwool, bottles and other equipment used in the preparation of the medium, and sterilising the laboratory and equipment which cannot be autoclaved with a 70 % ethanol suspension, minimised the problem and a healthy bollworm culture could be established.

VIRUSES

- (S)T.211/1: PURIFICATION AND ELECTRON MICROSCOPY OF A PVY-GROUP VIRUS OF BURLEY TOBACCO. 1977-1978
J. Thatcher

During the 1974/75 tobacco growing season a serious outbreak of a disease, mainly on Burley tobacco, was reported from the Tzaneen district. The symptoms were a mild vein clearing and/or mottling at the top leaves, bright yellow blotches and/or ringspots of the middle leaves, and a general chlorosis or broad, yellow vein-banding of the lower leaves. Dwarfing was not conspicuous unless the plants became infected at an early stage.

Mechanical transmission to healthy tobacco plants in a glasshouse from various field infected tobacco plants as well as tomato and weed plants showing virus-like symptoms in the vicinity of infected tobacco lands, was carried out. Extracts from infected Burley CB31, flue-cured Hicks 76 and A23 tobacco plants and from diseased tomato plants produced systemic symptoms identical to those observed in the field. No transmission was, however, obtained from two species of weeds.

It was shown that the causal virus is a filamentous particle with properties that place it in the PVY group of viruses. Particle length is 775-875 nm; thermal inactivation point, 56-58 °C; dilution end point, 10^{-3} - 10^{-4} ; and longevity in vitro, 48-72h. The virus appears to be a hitherto undescribed strain of PVY, but this still has to be confirmed serologically.

Publication

Thatcher, J., 1978. Isolation of an apparently new PVY strain from Burley tobacco. *Phytophylactica* 10, 73-74

HORTICULTURE

Flowers, Ornamentals and Herbs

WEED CONTROL

(A)T-Rp.111/1:

EVALUATION OF NEW HERBICIDES IN HORTICULTURAL CROPS:
EVALUATION OF NEW HERBICIDES, CUTFLOWERS, BULB AND
ORNAMENTAL PLANTS AND ON LAWNS. 1967-1979
Ruth Meissner

As weeding of ornamentals and lawns by cultivation or hand is difficult and often impossible, increasing use of herbicides is made for the control of undesired plants. However, only limited knowledge is available about the reaction of the desired plants, as species of the same genus and even the varieties of a species will not always respond in a similar manner to a herbicide. It is also known that the susceptibility of ornamental plants to herbicides varies in countries with different climates.

1. Herbicidal control of volunteer *Silybum marianum* in wheat

The variegated thistle (*Silybum marianum* (L.) Gaertn.) contains the sought-after pharmaceutical material silimarín. As it is intended to grow *S. marianum* in rotation with wheat, the volunteer plants could become a serious problem. The purpose of this study was therefore to determine the efficacy of some herbicides on volunteer *S. marianum* in irrigated wheat.

The results of the trials proved that in wheat the volunteer weed when sprayed at the two to three-leaf stage, was controlled 100% selectively by picloram and methabenzthiazuron in combination with a phenoxyacetic acid compound at rates normally recommended for weed control in wheat.

2. The effect of herbicides on different lawn grasses

Bluegrass (*Poa annua*) is a common winter weed in lawns which can be effectively controlled by the herbicide pronamide. Khakiweed (*Alternanthera pungens*) and brayulinea (*Brayulinea densa*) are most troublesome perennial weeds in sports turfs; dicamba can be used for their control. But it is known that lawn grasses can adversely respond to herbicides. This does not necessarily imply that certain grasses are susceptible to all herbicides, but that a certain grass species may be more sensitive to a specific chemical than others, and other grasses again to another weedicide.

The objective of the investigations which were done over several years, was to test the effect of pronamide and dicamba on some local popular turf grasses. The trials were carried out on established demonstration stands of 18 different lawn grasses at the Horticultural Research Institute.

It was found that the *Cynodon* grass 'Outeniqua' was the only grass tested which was badly injured by pronamide. As for dicamba, injury to 'Kikuyu' (*Pennisetum clandestinum*) and 'St. Augustine' (*Stenotaphrum*) was severe. Among the *Cynodon* grasses, not all were equally resistant to this herbicide: some were susceptible and some were only slightly affected.

During these trials it was noticed that the different grass stands were not infested with *Euphorbia* spp. weeds to the same degree, although all of them received the same treatment. For instance, 'Kikuyu' and 'Cape Royal' proved to be fairly resistant to weed infestation, whereas 'Hall's Selection' and 'Outeniqua' were susceptible even when well cared for.

3. Effect of some herbicides on ranunculus (*Ranunculus asiaticus* L.)

The production of ranunculus tubers from seed is an intensive horticultural practice. The very light seed is planted from the end of March till the beginning of May and germinates after 3 to 6 weeks. The seedlings grow very slowly during the winter months and because of this and the long germination period, weeds are extremely troublesome.

The object of this study was to evaluate herbicides for use on direct-sown ranunculus; the herbicides were tested for control of weeds from the time of seeding in early autumn until the harvesting of the tubers in the following early summer.

More than 20 eligible pre-emergence herbicides were tested, but all of them injured the seedlings badly without controlling the seeds at the low rates applied. Soil preparation with dinoseb triethanolamine salt gave good results, controlling the weeds until the straw cover was removed from the seedbed for cultivation purposes, and without injury to the crop seedlings.

To determine the waiting period after the dinoseb application for safe planting the ranunculus seed, bio-assays with mustard, lettuce and teff grass seed were carried out. They proved that under local climatic conditions during early autumn a waiting period of ten days is adequate.

To mention a side effect, it was clear that after soil treatment with dinoseb, the germination percentage of the crop seed was increased and the growth of the seedlings stimulated. The reason for this is possibly that dinoseb is known to have fungicidal and insecticidal properties.

In spite of many evaluation trials, no suitable post-emergence herbicide could be found. This agrees with the findings of English researchers on the closely related anemones (*Anemone hortensis*).

To summarise, neither a selective pre-emergence nor post-emergence herbicide could be found for use on ranunculus. Seedbed preparation with dinoseb/triethanolamine salt proved to be very effective. It kept the seedbeds, which are normally covered with grass for three months, practically weedfree and stimulated seed germination and growth of the seedlings.

Pome and Stone Fruit

APPLES

STORAGE

- (S)WP.247/2: INFLUENCE OF PRE-HARVEST AND PRE-COOLING FACTORS ON KEEPING QUALITY: POST-HARVEST PREDICTION OF BITTER PIT IN APPLES. 1976-1978
G.J. Eksteen

Prediction of bitter pit in apples at commencement of picking was first used in South Africa in 1962. The method was developed by Ginsburg (1962) and provided a rough guide as to whether a high or low incidence of bitter pit would develop during storage. During the past three seasons two methods, both based on induced ripening, were used to accelerate the development of bitter pit lesions within a week after picking. The cultivars Cox's Orange Pippin, Golden Delicious, White Winter Pearmain and Granny Smith were harvested two weeks before and at commencement of commercial harvesting. The two methods tested were:

1. Stimulation with ethylene (Ginsburg method)

The apples were held in an atmosphere of 0,1 % ethylene at 20 °C and 90 % RH.

2. Stimulation with ethephon (Bangerth method)

The apples were dipped in a water solution containing 2000 ppm ethephon and then kept at 20 °C and 90 % RH.

The two techniques reviewed are basically similar, but because the Bangerth method is easy and safe, it is preferred to the ethylene method. The harvesting of apples two weeks prior to the commercial harvesting date tends to predispose apples to bitter pit, therefore the use of immature apples may give a wrong indication with regard to the bitter pit potential. It is therefore recommended that sampling be done just before the commercial harvesting of the crop. The incidence of bitter pit at this stage should provide a reasonable indication as to the bitter pit that would develop in apples during storage.

Results indicate that due to seasonal variation and the relatively low correlation found in results, only a rough guide as to whether a high or low incidence of bitter pit would develop, can be achieved by using these prediction techniques. They, however, proved to be reliable enough in providing the producer with a relatively simple method for gauging his annual bitter pit potential so that he can now plan his marketing pattern. Further useful information is knowing which orchards are likely to provide apples with the least bitter pit.

Publications

- Ginsburg, L., 1962. Bitter pit should no longer threaten the good name of South African apples. *Decid. Fruit Grow.* 12, 239-244.
Ginsburg, L., Eksteen, G.J. & Visagie, T.R., 1976. Bitter pit prediction. *Information Bulletin* 326 of Fruit & Fruit Technology Inst. (FFTRI).
Eksteen, G.J., Ginsburg, L. & Visagie, T.R., 1977. Post-harvest prediction of bitter pit. *Decid. Fruit Grow.* 27, 16-20.

PEACHES

NEMATOLOGY

- (A)T-Rp.139: BREEDING AND SELECTION OF EELWORM-RESISTANT PEACH
ROOTSTOCKS. 1972-1980
A.P. Fresno

In the summer rainfall area of South Africa, *Meloidogyne incognita* was found to be the most common nematode species parasiting peach trees, followed by *M. javanica*.

A screening technique was developed to evaluate large numbers of peach seedlings for resistance to root-knot nematode. Pure cultures of *M. incognita* and *M. javanica* were obtained by growing egg-masses singly in sterilized soil. Tomato seedlings (Cv. Roodeplaat Premier), proved to be better host plants than beans (Cv. Top Crop) or green peppers (Cv. California Wonder) for increasing the populations, but there are practical advantages in using green peppers.

To infect peach seedlings, three inoculation media at various concentrations were tested, viz. water suspensions of larvae, egg-masses and chopped infected tomato roots. All three were successful, but the use of infected tomato roots was adopted as standard procedure because it is less time-consuming and laborious. A concentration of 1,59 infected tomato roots per dm³ of soil gave maximum infection of susceptible peach roots.

Rooted cuttings of 15 Nemaguard and eight Okinawa selections, as well as the Nanking Cherry (*Prunus tomentosa*), were tested for resistance to root-knot. Cuttings of Nemaguard selections 8 and 14 were resistant to both *M. incognita* and *M. javanica*, suggesting that the *M. incognita* and *M. javanica* characters are linked or controlled by the same genes.

Okinawa selections 3 and 6 were resistant to *M. javanica*, but because their chilling requirements are low they blossom early and their crops would be damaged by late frost. For this reason they are unsuitable for the summer rainfall area.

Nanking Cherry was susceptible to *M. javanica*.

The (F2) seedlings of the various Nemaguard selections were also tested for nematode resistance. Numbers 8 and 14 gave the lowest segregation ratio and degree of infection. They were the most promising for resistance to both *Meloidogyne* species. The results suggest that the character for resistance to root-knot nematode in the two Nemaguard selections breeds true to type and is polygenic.

Vegetatively propagated peach material was obtained from softwood cuttings wounded and treated at their base with IBA at a concentration of 1 000 ppm.

The effect of soil temperature on root-knot resistance was studied in Nemaguard selections 8 and 14. Whereas nematode resistance is nullified in tomatoes and certain other crops when soil temperature exceeds 28°C, there is no relationship between temperature and degree of resistance in these two Nemaguard selections.

PLANT PHYSIOLOGY

- P.J.C. Stassen: SEASONAL UPTAKE OF NUTRIENTS AND THE SEASONAL
PATTERN FOR THE ACCUMULATION, STORAGE, MOBILIZATION
AND UTILIZATION OF CARBOHYDRATE AND NITROGEN
CONSTITUENTS BY TWO YEAR OLD KAKAMAS PEACH TREES
GROWN IN SAND CULTURE.
(Research Project (S)WP.175/4)
Ph.D. : University of Stellenbosch. 1980
Supervisor: Prof. D.K. Strydom

From six weeks prior to bud-break (1974) to six weeks after bud-break (1975), trees were lifted every third week and sub-sampled in different tree parts. Determinations of different carbohydrate and nitrogen constituents were done.

The seasonal pattern in dry mass of the tree as a whole showed a sharp increase during the period extending from three weeks after bud-break (1974) until termination of short-extension growth. This increase was attributed to contributions made by permanent parts as well as the new growth. For the next period continued three weeks before final leaf-drop, a more gradual increase occurred. A gradual decrease then occurred three weeks after bud-break (1975). This decrease was attributed to a decrease in all permanent parts but especially in the roots.

The period extending from three weeks after bud-break until harvest was characterised by a sharp increase in total sugar which was dominated by the sugar content of the fruit. At harvest the total sugar content of the fruit contributed 75 per cent to the total sugar content of the tree as a whole.

During the period which commenced nine weeks after bud-break and continued until six weeks before final leaf-drop, the starch content increased. This increase was dominated by the contribution of the roots, although the wood also played an important part. A significant loss in starch content was recorded during the period which commenced at final leaf-drop and continued until the termination of the experiment. It was postulated that starch was hydrolyzed to serve as a source of energy.

During the period which extended from nine weeks before final leaf-drop, the tree as a whole showed a decrease in hemicellulose content. This was mainly due to a decrease in the roots and to a lesser extent in the wood and bark. It was postulated that at least a part of the hemicellulose fraction could be hydrolyzed to serve as reserve material during the above-mentioned period.

The seasonal pattern for total N showed two periods of active absorption, namely from three weeks before bud-break until three weeks before termination of shoot extension growth and from three weeks before until three weeks after final leaf-drop. The active absorption which occurred during the first period was evidently not sufficient to supply in the requirements of the new developing growth of which the leaves received the major portion. At the completion of shoot-extension growth, for instance, the total N content of the leaves and fruit contributed 35 and 15% respectively to the total N content of the tree. N reserves were therefore mobilised in the permanent parts. Both protein N and soluble N, especially arginine and asparagine, played a role as N reserves. These reserves accumulated during the second period of active N absorption around final leaf-drop.

The distribution of the two major components of the soluble N fraction differed in so far that arginine mainly accumulated in the roots whilst asparagine mainly occurred in the fruit.

The effect of different concentrations of applied nitrogen (210, 21 and 2.1 mg/l) at the different combinations during the summer (20.1.76 to 19.3.1976) and autumn (19.3.1976 to 12.7.1976) on the carbohydrate and nitrogen status as well as the phenological development of pot-planted peach trees was studied.

Full autumn N application resulted in earlier flowering and a better fruit-set than trees which received reduced autumn N applications. More reproductive buds also developed into flowers and eventually set fruit, when the full autumnal N was applied.

Reduced summer and autumn N applications resulted in a lower root mass in winter.

With a few exceptions, starch and especially hemicellulose concentrations were not drastically affected by summer and autumn N applications.

Reduced levels of autumn N resulted in decreased concentrations of all N fractions in wood, bark and roots, regardless of the level of summer N. This was especially true during mid-winter. Arginine especially was very sensitive in this respect.

A positive correlation was established between the amount of N reserves utilized from mid-winter until nine weeks after bud-break and the dry mass of the new growth.

It was thus concluded that the new growth which developed during the second growing season, was to a great extent dependent on the stored N which was in turn dependent on the N application during the previous autumn.

PEARS

FRUIT SETTING

(S)WP.250:

FRUIT SET STUDIES OF PACKHAM'S TRIUMPH PEAR. 1974-1980
H.J. van Zyl

The Packham's Triumph pear cultivar has a tendency of poor fruit setting in spite of regular and heavy flowering. In this study a systematic investigation was carried out on all the factors which could possibly affect the fruit set and on practices with which fruit set could be improved.

It was found that good pollination is more important with young trees than with older and less vigorous trees. With young, vigorous-growing trees fruit set could be improved statistically, and in some cases drastically, by the removal of strong shoots during the winter, followed up by the tipping of new shoots approximately 10 days after full-bloom. The reduction in shoot growth during early spring has probably canalized more carbohydrates to the fruitlets. It was demonstrated with ¹⁴C-studies that the growing points of burse shoots are strong sinks for C-products. By the removal of the shoot tips, C-products were canalized away from the shoots to the fruitlets.

It was also found that in older, non-vigorous trees, fruit set could be improved by heavy spur pruning during the winter, because fewer flowers have to compete for the available nutrient reserves.

Fruit drop was related to the abortion of embryos and endosperms. The solution of the problem lies in good provision for pollination and certain pruning techniques to reduce growth and flowering.

PLUMS

CULTIVARS

- (S)WP.158/2: BREEDING OF NEW PLUM CULTIVARS: BREEDING RESEARCH AT THE POLYPLOID LEVEL. 1965-1979
B.K. Nortje, M.J. van Tonder and L. Ginsburg

The object of the breeding programme was to develop new hexaploid plum cultivars suitable for both drying and dessert purposes. This involved controlled crosses on the hexaploid level between selected parents derived from *Prunus domestica*. Attempts at inter-species hybridization were also made in which selected hexaploid offspring of Marianna were crossed with *P. domestica*.

None of the hexaploid progeny of Marianna bore any fruit and because of the general sterility, the envisaged interspecific crosses could not be made. Crossing on the hexaploid level with *P. domestica* resulted in 734 seedlings, 20 of which were further evaluated in the Tulbagh area. None of these proved suitable for drying, but three selections, namely 30/16, 31/29 and 32/36 were found to have very good keeping quality. Accordingly, they are to be finally evaluated for dessert purposes and assessed as possible new cultivars for the export market.

Viticulture

TABLE GRAPES

IRRIGATION

- (S)WP.254/2: LYSIMETER STUDIES REGARDING IRRIGATION SCHEDULING. 1974-1978
F.C. van Rooyen

A group of 12 drainage lysimeters was employed to study the effect of 5 different soil moisture regimes varying from 0 to -1 bar soil moisture potential on the yield, fruit quality and vegetative growth of table grapes over two seasons. The treatments were applied separately in two growth phases according to a central composite rotatable statistical model with two X-variables denoting the two growth-phases, enabling the prediction of optimum treatment-combinations for the different growth parameters. The majority of these parameters showed a highly significant correlation with the applied soil moisture regimes.

Yield was strongly influenced by soil moisture potential, even though the minimum applied potential was only -1 bar. The first growth phase extending from budbreak until the start of the ripening phase, had a dominant influence on yield. An optimum combination soil moisture regime of 82/12 % total available moisture (phase 1/phase 2) is predicted by the model. In terms of soil moisture potential this optimum lies at -53/-275 millibar.

The quality parameters were influenced by the treatments in both phases 1 and 2 (ripening) and the effects were contradictory: a wet soil moisture regime during phase 2 had a beneficial influence on both sugar content and berry quality, whereas a wet regime during phase 1 had a detrimental influence on the sugar/acid ratio, berry-burst and number of loose berries after cold storage. The predicted optimum for fruit quality was therefore set at 70/85 % total available moisture (TAM).

Shoot and root growth, stem circumference, leaf surface area and stomata concentration were strongly influenced by the soil moisture regime during phase 1, and a wet regime generally had a favourable influence. Little vegetative growth took place during phase 2.

The diffusive resistance of the leaves for water vapour transport showed a sharp reaction to changes in soil moisture potential on the wet side, and the reaction was more gradual below -45 millibars. A linear correlation was found between consumptive use (evapotranspiration) and yield, without any decrease in yield at high consumptive use. The consumptive use of the vineyard was relatively low with an average of 240 mm per season, and a linear relationship was found between mean integrated diffusive resistance and

yield. Curves of time versus consumptive use and consumptive use factors (crop factors) were drawn and showed large differences between treatments.

The highly significant reaction of vines to changes in the soil moisture potential between the limits of yield capacity and -1 bar, proves equal availability of soil moisture for plants between yield capacity and permanent wilting point. It is concluded that soil moisture potential should under no circumstances be allowed to fall below -1 bar. The final combination soil moisture regime for optimal yield, fruit quality and vegetative growth, considering all factors, is set at 70/85 % TAM or the equivalent, namely -150/-50 millibars mean maximum soil moisture potential. The general pattern of plant reaction to a variation in soil moisture potential can be extrapolated to other perennial fruit crops, taking into consideration the fact that the magnitude of reaction of some parameters might differ to a certain extent.

Citrus and Subtropical Crops

BANANAS

PHENOLOGY

- (S)N.101/1: PHENOLOGICAL STUDY OF THE BANANA PLANT: STUDIES ON LEAF EMERGENCE, FLOWER INITIATION AND FRUITING CYCLE. 1968-1979
F.A. Kuhne, S.J. Bozalek, A.J. Alberts and J.J. Kruger

The object of the study was to establish the mean monthly leaf emergence rate, the number of leaves produced during the plant's life cycle and the periodicity of leaf emergence. The pre- and post-emergence life of bunches eventually borne by plants starting as "peepers" and emerging during each month of the year was also established. The data were collected from newly established and existing plantations at the Burgershall Research Station and the Levubu Experiment Farm. It was found that the total development period from a peeper to bunch harvest exceeded two years, a period much longer than anticipated. The leaf-emergence rate varied from month to month, was greatest in summer and did not exceed three leaves per month. In winter, however, virtually no growth took place. The flower emergence-bunch harvest interval was also found to vary from month to month. Flowers emerging in November and December took only ± 120 days to reach maturity, whilst flowers emerging in autumn took between 180 to 220 days to reach maturity. The information gathered provides a better understanding of the cyclic production of bananas in South Africa.

From these data it is possible to forecast the harvesting date (Fig. 1). With monthly flower counts a grower can forecast at all times what to expect from his plantation.

CITRUS

CULTIVATION

- (A)S-Pr.58/6: WIND BLEMISH OF CITRUS FRUIT : EVALUATION OF WINDBREAK EFFECTS. 1974-1979
S.J. Bozalek, C. Welgemoed and J.P. Carstens

Wind blemish on citrus fruit is as old as citrus cultivation itself. With increased competition on the overseas markets it has become more and more difficult to dispose of fruit bearing ugly wind marks. Lower prices paid for this type of fruit necessitated the introduction of more stringent regulations regarding the export quality. As a result an appreciable fraction of the citrus production failed to qualify for overseas markets.

Sometime in the early seventies a fabric called polyethylene made its appearance and it was suggested that this artificial fabric could be used successfully to reduce the wind velocity in the fruit orchards. Successfully because the permeability of the fabric could be controlled during its manufacture. Australian researchers claim that windbreaks also exert very beneficial effects on quality and quantity of the citrus fruit.

The Department decided to investigate these claims under local conditions and embarked on this project in 1974. Sets of windbreaks made of the artificial fabric and of various geometrical shapes from the parallel set to the rectangular shape were erected at Zebediela in the Northern Transvaal, Malelane in

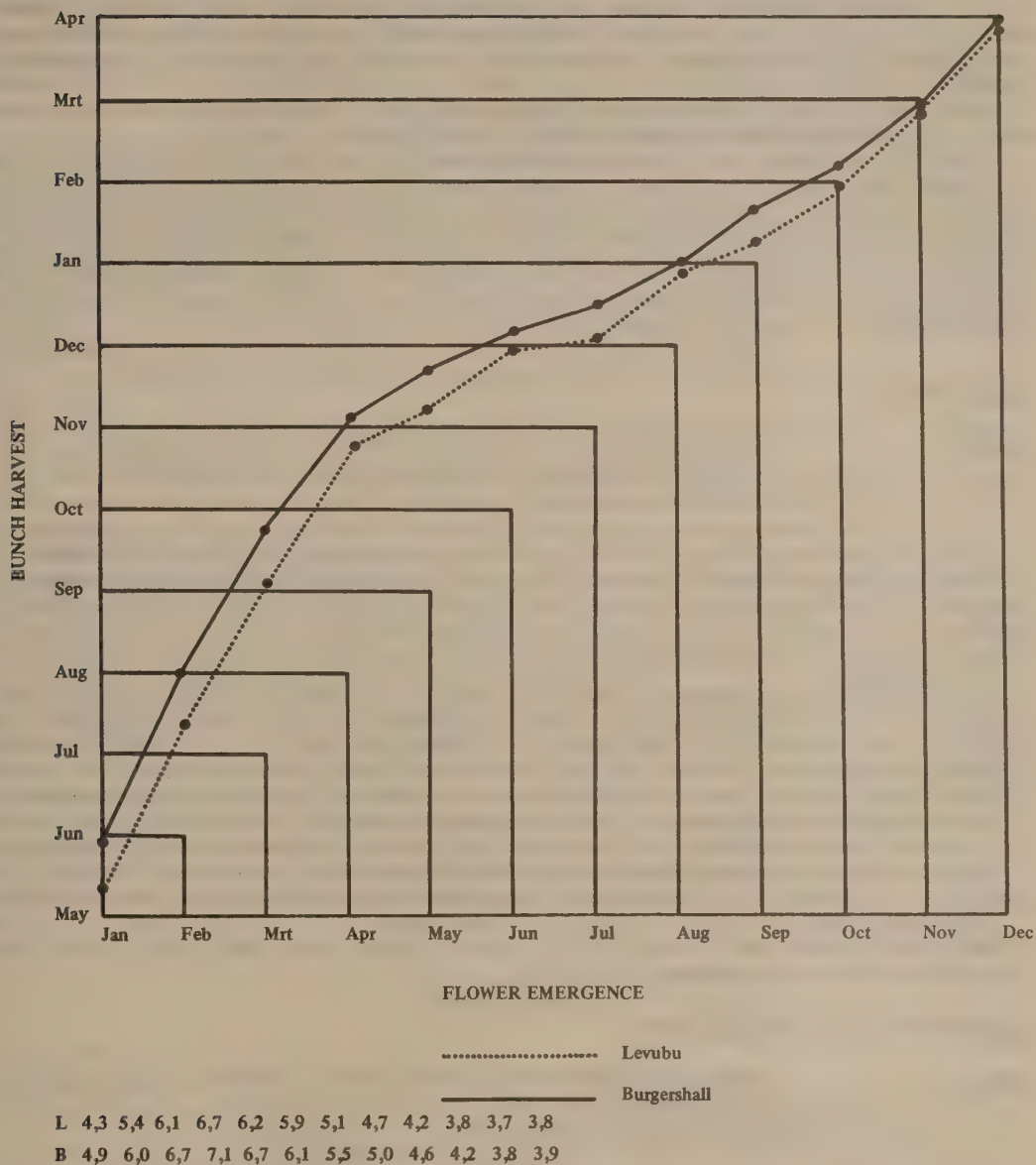


FIG. 1 - Estimation of harvest date of bananas for Burgershall and Levubu

the Eastern Transvaal and Patensie in the Eastern Province. Navel and Valencia oranges were tested over four seasons for mass, rind thickness, percentage waste, fibre strength, total soluble solids (T.S.S.) and the ratio of T.S.S. to acid, since all these factors determine the quality of citrus fruit.

No significant differences between the protected and unprotected fruit could be established. However, the counts of fruit with wind blemish were without exception significantly lower for the protected orchards, thus reaffirming that windbreaks today offer the best protection from wind. The results have shown that where the orchard is protected by a windbreak as much as 95 % of the fruit can be without wind blemish. The largest wind damage was recorded in the Malelane orchards where 22,1 per cent of the fruit failed during one season to meet the export standards.

Regarding the economics of artificial windbreaks, the project has shown that windbreaks are economically viable when they are laid out parallel to each other. An interval of 150 m between the windbreak should provide satisfactory protection under most of the wind conditions encountered in this country. The choice of natural or artificial windbreaks will, of course, largely depend on the availability of water supplies, and cost of polyethylene fabric. If the fabric is allowed to stay on the support for only three months after petal fall each year, its lifetime can at least be doubled. Because few areas in the country under citrus cultivation are free from wind hazard, it can be safely said that no commercial citrus orchard should be without its windbreaks.

INSECT PESTS

- (S)N.93/2: PHYTOSANITARY STUDIES OF CITRUS FRUIT: CONTROL INVESTIGATION OF FRUIT FLIES ON CITRUS. 1955-1976
I.B. Kok

The two important species of Tephritidae, Diptera, in citrus and subtropical fruit culture are the Mediterranean fruit fly *Ceratitis capitata* (Wied.) and Natal fruit fly *Ceratitis rosa* Karsch. Most subtropical fruits (mango, guava, avocado, litchi) and coffee, are also attacked by these two important species and it has recently been established that the Marula fruit fly *Ceratitis cosyra* (Walk.) also infests mangoes. It appears that the Natal Fruit fly predominates in numbers in the subtropical fruit growing areas of South Africa.

Organised baiting of orchards is sufficient to control the pest. Bagging of fruit is found to be the most practical control measure in litchi orchards, provided this is done at an early stage of fruit development. This method also has the advantage of protecting the fruit from litchi moth, *Cryptophlebia peltastica* Meyr., fruit-eating bats and adverse weather conditions. Bagging also allows the fruit to mature fully before being harvested, while bagged litchi fruits are found to be bigger and exhibit a better colour.

Low-temperature storage tests as a possible method of sterilising fruit fly infested citrus fruit for phytosanitary export requirements were investigated and the results are most conclusive. The mortality of fly larvae in lemons held at -0,5 °C for 6 days is 94,61 %, and 100 % if held for 9-12 days at this low temperature. The mortality of fly larvae in Swaziland grapefruit held at -0,5 °C for 12 days is also 100 %.

Satisfactory tests were carried out with E.D.B. fumigation of fruit fly-infested citrus fruits. Fumigation at a dosage rate of 16 mg E.D.B. per litre for 2 hours is adequate to kill all the fly larvae present in the fruit without additional cold storage.

ROOTSTOCK - SALT TOLERANCE

- (S)N.1/13: EVALUATION OF FIVE CITRUS ROOTSTOCKS FOR SALT BRACK SENSITIVITY. 1978-1980
P.J.L. Grobler

The aim of this study was to establish a short term evaluation method to determine the salt brack sensitivity of citrus rootstocks. A factorial trial was laid out according to a completely randomized block design with seven replications consisting of two factors, viz. five rootstocks and two salt levels. The experiment was laid out in pots in a glasshouse. The growth medium consisted of fine grained sand, irrigated with a complete nutrient solution.

The following observations were made:

- Total growth and fresh root weight were determined. A fortnightly measurement of the total growth was taken to establish the growth rate.
- The leaf anatomy was investigated and the palisade parenchyma cell length in relation to the total leaf diameter was established.

- Leaf symptoms were observed and photographed.
- The cytological changes in the cells were investigated by means of an electron microscope.
- Betaines were determined in the above ground sections of the rootstocks.
- Following extraction the ultra-violet light fluorescents and absorbents in the roots of the rootstocks were determined and compared. This was done by means of thin-layer chromatography.
- A complete analysis of the plant nutrient content of the above ground parts of the rootstocks was done.

The Cleopatra rootstocks maintained the highest growth rate and the Rough lemon plants were the tallest. The addition of NaCl had a reducing effect on the total length of all the rootstocks except the Troyer. The growth rate of Cleopatra was the least influenced followed by the Rough lemon, Citrumela, Troyer and Trifoliata. The addition of $Mg(NO_3)_2$ and $Ca(NO_3)_2$ had an enhancing effect on the growth of the Rough lemon, Cleopatra and Troyer rootstocks.

The Rough lemon had the highest fresh root weight. Although Cleopatra had a higher growth rate than Troyer and Trifoliata, it had a smaller fresh root weight. The salt factor did not have any effect on the fresh root weight of the rootstocks.

Only the Citrumelo showed leaf-damage symptoms at the different salt levels.

Differences were found in the anatomy of the leaves of the different rootstocks. The measurement of the palisade cell length will not be a successful technique to establish salt tolerance.

The internal membrane structure of the chloroplasts were damaged by the high salt content in the nutrient solutions.

The increase of NaCl in the nutrient solution enhanced the sodium and chloride content of the above ground parts of the rootstocks.

The nitrogen, phosphorus, iron, zinc, manganese, copper and boron content of the above ground parts of the rootstocks were not influenced significantly by the addition of and increase in NaCl in the nutrient solution. In contra-distinction to this, the potassium content of the rootstocks reduced with the increase of NaCl in the nutrient solution.

Only the Cleopatra and Citrumelo rootstocks showed a decrease in magnesium content with an increase in NaCl in the nutrient solution. The calcium content of the Troyer and Cleopatra rootstocks decreased with an increase in NaCl in the nutrient solution.

A remarkable difference in the nutrient content of the rootstocks was found. The sodium and chloride content of the Rough lemon rootstocks were the highest.

Due to the intricacy of the critical determination of betaines, a very high variation coefficient was calculated. This excludes the use of betaine determination as a probable method for salt tolerance evaluation.

It is concluded that to perform a salt tolerance evaluation test of this kind, the following factors should be taken into consideration: the movement of salts across the bud-union; the climatic requirements of each rootstock; a representative growth parameter must be used and the above ground fresh weight: root weight ratio must be determined.

Although no consistent short term evaluation technique for the salt tolerance of citrus rootstocks was established, much information regarding rootstocks was collected.

GRANADILLA

EVALUATION

(S)N-88/1: TESTING OF HYBRIDS AND IMPORTED GRANADILLAS:
PRELIMINARY STUDIES ON SUITABILITY FOR FRESH FRUIT
AND PROCESSING. 1973-1978
F.A. Kuhne, A.I.J. Bester, J.C.D. Theron

The purpose of the project was to evaluate newly imported granadilla species of hybrids for eating and processing purposes and to compare the yield, lifespan and resistance to diseases with that of the common purple granadilla.

During the period of study 20 introductions were made. The results have been most disappointing, since only one species showed promise, namely *Passiflora edulis* forma *flavicarpa* which was originally imported from Hawaii. The other *Passiflora* species and hybrids tested showed no promise as a fruit for commercial use or as a rootstock. It would appear that these species which originate in Central and South America are more acclimatised to the cooler mist-belt areas, which possibly explains the poor performance obtained.

Nuts**MACADAMIA****EVALUATION**

(S)N.96/1:

**MACADAMIA STUDIES: EVALUATION OF SELECTIONS IN THE
REPUBLIC. 1968-1980**
A.J. Joubert, L.C. Bolt, J. van Eykeren

The aim of the project was to conduct a survey of all macadamia seedlings in the Republic to select promising ones for release as cultivars for commercial production. Thousands of seedling trees were evaluated during the course of the project. Samples of 377 trees were tested for quality. Sixty trees were selected as promising and daughter trees were propagated for further testing. Two of these selections were found to be promising in all respects and released as cultivars, i.e. Nelmak 1 and Nelmak 2.

Overseas cultivars were imported and tested, i.e. Keauhou, Kakea, Keaau, Ikaika, Beaumont, Rickard, Greber, Teddington, Elimbah, Kau, Cate 2, HAES 790 and HAES 781. The best performance was obtained from the cultivars Keauhou, Kakea, Ikaika and Keaau. These four are now also recommended for commercial planting. Seedling trees are no longer planted by farmers and existing seedlings have been and are being topworked to the recommended cultivars.

According to a recent survey the macadamia plantings in the Republic consist of the following cultivars:

Nelmak 1	-	8 000
Nelmak 2	-	35 000
Keaau	-	5 000
Keauhou	-	27 000
Ikaika	-	5 000
Kakea	-	2 000
Beaumont	-	3 000
Other	-	4 500
Seedlings	-	1 500
		91 000

From these figures it is obvious that the project on the survey and selection of seedlings can be regarded as concluded and that the South African macadamia industry is now firmly established on good cultivars.

ANIMAL PRODUCTION

PRODUCTION

Animal Type

ANGORA GOATS

NUTRITION

L. de W. Louw: EFFECT OF LEVEL OF ENERGY AND PROTEIN NUTRITION ON PERINATAL LOSSES, LACTATION AND LAMB GROWTH IN THE ANGORA GOAT. (Research project K-Gf.138/4)
M.Sc. (Agric.) : University of Pretoria. 1979
Supervisor: Prof. J.W. Nel

This experiment was carried out in order to study the influence of various levels of energy and protein nutrition on the reproduction losses, lactation and growth of lambs in the Angora goat. Fifty-six pregnant Angora does were divided at random, on the basis of body mass, into four groups. Each group received one of the following rations both during the last third of gestation and during lactation:

HP	:	HE	(High protein	:	High energy)
HP	:	LE	(High protein	:	Low energy)
LP	:	HE	(Low protein	:	High energy)
LP	:	LE	(Low protein	:	Low energy)

Both a metabolic digestion trial, using 12 castrated Angora goats (three per group) and an *in-vitro* digestibility determination were carried out on the four experimental rations for the purpose of comparing their digestible energy content. An exceptionally good correlation was found between the results produced by the two techniques.

The various levels of protein and energy nutrition had a highly significant ($P < 0,01$) effect on change in body mass of the experimental does during gestation but had no significant influence on the body mass during lactation.

Udder development of experimental does began approximately six to eight weeks before *partus*. Although both energy and protein nutrition influenced udder development, it was primarily the level of energy nutrition which exerted this influence.

Forty-six per cent of the experimental does produced twins. This exceptionally high fecundity can be attributed to the influence of the MAP-sponges used to synchronize heat periods and/or the relatively high nutrition level of the does during the pre-mating period.

Within six hours after lambing the colostrum production of does in the four groups already showed notable variation. Some does in the low protein and low energy groups had at that stage not yet produced any colostrum.

The average daily production of milk was higher when kids were removed from their mothers after eight hours than when removed after 16 hours. The various levels of energy nutrition consumed during lactation had a highly significant ($P < 0,01$) effect on the average daily production of milk after removal of kids both after eight and after 16 hours.

The average daily body-mass increase of the kids in the HP : LE, LP : HE and LP : LE groups up to the age of four weeks was highly significantly ($P < 0,01$) positively correlated with the average daily milk production of the does. In the case of the HP : HE group, however, the correlation was not significant.

During the lactation period the milk from the two high energy groups had a significantly ($P < 0,05$) higher average lactose content than the two low energy groups.

The milk of does in the high energy groups had the highest fat content.

The efficiency of milk conversion during the first six weeks after birth was the best for kids in the two high energy groups, followed by the artificial milk group and the two low energy groups respectively.

Although the various protein and energy levels did not significantly affect the birth weight of the kids, this can possibly be attributed to the overruling influence of the high percentage of multiple births among the experimental ewes.

According to results it appears that Angora kids under intensive management can be weaned more successfully on a lower body weight, provided that a starting meal and green feed are made available to the kids at an early stage.

The average daily weight gain of experimental kids from birth to four weeks was highest in the HP : HE group, followed by the HP : LE, LP : HE, artificial milk and LP : LE groups respectively.

The weaning weight of the experimental kids in the HP : HE, HP : LE, LP : HE, LP : LE and artificial milk groups was highly significantly ($P < 0,01$) positively correlated with the weight at five months of age ($r = 0,870; 0,876; 0,932; 0,944$ and $0,941$ respectively).

The various protein and energy levels had a highly significant ($P < 0,01$) influence on the raw hair production of the experimental does in all the experimental groups. The average raw hair production during the experimental period was highest for the HP : HE group, followed by the HP : LE, LP : HE and LP : LE groups respectively.

The average total weight of raw hair of the experimental kids at five months was 1 228,6; 1 133,1; 887,5; 839,6 and 1 195,8 gm in the HP : HE, HP : LE, LP : HE, LP : LE and artificial milk groups respectively. The various protein levels which were fed to the experimental does during the experimental period, alone were responsible for the highly significant ($P < 0,01$) effect on the raw hair weight of the experimental kids at five months. A highly significant ($P < 0,01$) positive correlation between raw hair production and average daily weight gain of the kids until five months was observed in all the experimental groups except the HP : LE and artificial milk groups.

BEEF CATTLE

BEEF PRODUCTION

H-Ps.214/1:

INTENSIVE BEEF PRODUCTION: THE EFFICIENCY OF BEEF PRODUCTION AT DIFFERENT LIVE MASSES. 1978-1979
H.J. van der Merwe and M. von La Chevallerie

The efficiency with which feed is converted into carcass mass during different stages of growth was investigated by means of metabolism and production studies in which Hereford x Afrikaner steers were utilized.

In the metabolism study the efficiency with which a ration consisting of 60 parts teff hay, 20 parts lucerne meal, 15 parts maize meal and 5 parts groundnut oil cake meal was utilized, was determined at 181, 272, 363, 454 and 544 kg live mass respectively. Dry matter (DM) intake increased significantly ($P < 0,01$) with an increase in live mass. No significant differences occurred with regard to DM-intake per metabolic mass unit per day between the various live mass groups. The apparent digestibility of crude protein was significantly ($P < 0,01$) higher at 544 kg than at 272 kg live mass and that of ether extract was significantly ($P < 0,01$) higher at 272 and 363 kg than at 181 kg live mass. No significant differences occurred among the various live masses with regard to digestible energy. Nitrogen and energy retention increased significantly ($P < 0,01$) with an increase in live mass from 181 to 544 kg. The rates of passage of hay through the omasum, abomasum and intestines, as well as the alimentary tract as a whole, were significantly ($P < 0,01$) slower at 544 kg than at 181 kg live mass. The rate of passage of hay through the reticulo-rumen was not significantly affected by differences in live mass.

In the production study, steers were fed the ration described above from 172 kg live mass up to time of slaughter. Five groups of six steers each were slaughtered at 186, 274, 367, 453 and 539 kg live mass respectively and the changes in body and carcass composition were determined. No significant differences occurred in growth rate among the various groups. Efficiency of feed utilization expressed as feed per unit of live mass gain, declined significantly ($P < 0,01$) with an increase in live mass. No significant differences in the efficiency of feed and digestible energy conversion to carcass mass, as well as to edible meat and fat, occurred among the various groups. This was due to an increase in the ratio of meat and fat to offal with increase in live weight.

Expressed as a percentage of body mass, the diaphragm, heart fat, kidney fat and stomach fat increased and the rest of the offal decreased significantly with an increase in body mass. Carcass measures increased significantly ($P < 0,01$) with an increase in live mass. The depth of thorax, rib thickness, circumference of buttock, length and depth of ribeye and ribeye area remained constant with an increase from 453 to 539 kg live mass. The same applied to the ratio of circumference to the length of buttock for

367 kg and heavier. Expensive retail cuts expressed as a percentage of carcass mass declined significantly with an increase in live mass from 186 to 453 kg. This was mainly due to a decrease in the percentage silverside. However, the greatest increase in dressing percentage occurred between live weight of 367 and 453 kg.

The cheap retail cuts such as the bolo and shin decreased percentage-wise whereas the hump, flat rib, brisket, thin flank, aitchbone and kidney plus fat increased with an increase in body mass. A significant reduction in the percentage muscle as well as bone and sinews was noticed with an increase in live mass. This was mainly due to a significant ($P < 0,01$) increase in the percentage fat. Of all carcass components tested, rib thickness showed the highest correlation with percentage muscle ($r = -0,86$) and percentage fat ($r = 0,92$) whereas the percentage shin in the carcass showed the highest correlation to the percentage bone and sinews ($r = 0,87$) in the carcass. No significant ($P < 0,01$) differences in the tenderness of meat occurred at live masses above 367 kg. It appears that the most suitable slaughter mass lies somewhere between 367 and 453 kg, as at this stage the carcass contains about 60 % muscle, 24 % fat and 16 % bone plus sinews. In practice the most suitable slaughter mass could, however, be influenced by factors such as feeding level, breed, sex, age and consumer's preference, and such effects warrant further investigation.

GROWTH STUDIES

J.A. Erasmus: THE INFLUENCE OF STRESS ON ADRENAL CORTEX AND THYROID ACTIVITY OF *BOS INDICUS* AND *BOS TAURUS* HEIFERS UNDER KRAAL AND VELD CONDITIONS.
(Research project OK-Do.66/6)
M.Sc. (Agric.): University of the OFS
Supervisor: Prof. Dr. A. Smit

The main object of this study was to determine whether pen conditions created stress in beef heifers, as measured by adrenal cortex activity.

Eighteen beef heifers, representing the *Bos taurus* (Shorthorn), *Bos indicus* (Afrikaner) and intermediate (Bonsmara) breeds, were confined to a kraal with floor space 4,6 m² (50 ft²) per heifer. The same number of heifers on the veld served as a control. Blood samples were taken at regular intervals for determination of adrenal cortex and thyroid activity. During the summer season haemoglobin, haematocrit and RBC counts were also determined.

Before commencement of the trial, Afrikaner and Bonsmara heifers had higher plasma cortisol values than Shorthorns.

Breed had a more pronounced effect on the presence or level of thyroxine. The Afrikaner heifers had the highest, and the Shorthorns the lowest values, this difference being statistically significant ($P < 0,05$). The Bonsmara heifers had intermediate thyroxine levels.

Kraaling had no significant effect on cortisol secretions of the beef heifers during the winter season. During this period the heifers exhibited slightly higher values in the kraal than on the veld, the Afrikaner heifers being influenced the most. Similarly, kraaling had no effect on plasma cortisol during the summer season. In the case of Afrikaner and Bonsmara heifers, hormone values were higher on the veld than in the kraal.

Kraaling had a significant ($P < 0,05$) effect on plasma thyroxine during the winter season. Thyroxine levels were significantly higher in the kraal than on the veld in Afrikaner ($P < 0,01$) and Bonsmara ($P < 0,05$) heifers. Only a small reaction was noticed in Shorthorn heifers. During the summer the influence of kraaling on thyroxine was much less, with only the Afrikaner heifers having significantly ($P < 0,05$) higher hormone values in the kraal than on the veld. Once again the Shorthorns were influenced the least.

Because food intake was restricted in kraal animals during the winter season, kraaling had a significant ($P < 0,01$) effect on live weight. The weights of the Afrikaner and Bonsmara were both significantly ($P < 0,01$) higher on the veld than in the kraal. The weights of Shorthorns were influenced to a lesser degree. During the summer season, kraaling also had a significant ($P < 0,01$) effect on live weights, with values being higher on the veld than in the kraal in Afrikaner ($P < 0,01$) and Bonsmara ($P < 0,05$) heifers. Positive correlations were obtained between cortisol and live weight during the winter while an inverse relationship prevailed during the summer season. During the latter season, a negative relationship was found between cortisol and weight gain. Thyroxine was not consistently correlated with live weight or weight gain.

Both adrenal cortex and thyroid activity were influenced by season. Cortisol secretion was significantly ($P < 0,01$) higher during winter than during summer months, while thyroid activity was

significantly ($P < 0,01$) depressed during the winter. There was a tendency for cortisol to be negatively associated with ambient temperature during both seasons. The relationship between thyroxine and winter temperatures was inconsistent. During the summer, thyroxine was positively correlated with temperature.

Dominance rank was clearly established amongst heifers kept in the kraal. Dominance was highly significantly ($P < 0,01$) correlated with weight, the most dominant heifers having the highest weights.

Kraaling had no significant effect on haemoglobin or haematocrit, although values tended to be higher in the kraal than on the veld. Only the Shorthorn heifers had significantly ($P < 0,05$) higher kraal than veld haematocrit values. Erythrocytes tended to decrease in the kraal in Afrikaner heifers, with the effect being less pronounced in the Shorthorn heifers. The Bonsmaras, on the other hand, showed no effect as a result of pen conditions.

Correlations between blood constituents and live weight were either weak or inconsistent. Only erythrocyte counts tended to be related to weight gain. However, results in the literature cited are contradictory, and make blood constituents unreliable for predicting weight gain. Temperature tends to be inversely related to blood constituents.

NUTRITION

(A)VS-Pr.39/3: EFFECT OF A HIGH NUTRITIONAL PLANE ON TESTICULAR FUNCTION AND DEVELOPMENT IN HEREFORD BULLS. 1969-1979
J.D. Skinner

Thirty-four bulls were randomly divided into two groups at 12 weeks of age and fed a pelleted ration containing 14,5 % crude protein and 74,9 % digestible energy. The Normal Plane (NP) Group did not grow faster than 1,0 kg/day while the High Plane (HP) Group exceeded 1,75 kg per bull per day. Semen was collected by electro-ejaculation and 4 bulls from each group was slaughtered at 12, 24, 52, 76 and 104 weeks respectively when the treatment was reversed for 26 weeks. The latter had no significant effect on semen quality. Sperm appeared in ejaculates at 42 weeks in both groups but the number of secondary sperm abnormalities increased significantly from 76 weeks of age in the HP Group, which appears to be related to the body-testicular temperature difference. This is significantly less in the HP Group as a result of a significant increase in the amount of fat laid down around and above the testes below the inguinal ring.

(A)VS-Pr.73/9: ORDER OF RANK IN EFFICIENCY OF THREE BREEDS OF BEEF BULLS ON A CONCENTRATE AND ROUGHAGE DIET. 1976-1979
H.H. Meissner, C.Z. Roux and H.S. Hofmeyr

The performance of beef bulls for selection purposes is tested under standardized conditions with the aid of a concentrate diet. Some bulls, and in particular some breeds, have a history of generations which have been kept almost solely on roughage (veld). Thus the question arises whether animals "adapted" to roughage can be tested effectively on concentrate diets. The question may be formulated in another way: Does breed-diet interaction exist? If not, the choice of diet is irrelevant to the concept of performance testing and possibly only important from a convenience point of view. If it does exist, the specific animal should be tested within the dietary environment to which it is accustomed.

The question was put to the test by using three divergent types of beef bulls, the Afrikaner, the Hereford and the Simmenthal. Half of the bulls of each breed were given access to a concentrate diet and the other half to a roughage diet following weaning at 12 weeks of age. Their growth, voluntary intake and feed efficiency were continuously recorded from 12 weeks until 90 weeks of age and masses of up to 600 kg.

During this whole period the order of rank between breeds stayed the same and the relative performance of the breeds was in fact identical on both diets. For any given amount of feed consumed the Afrikaner produced 100 units of mass, the Herefords 118 and the Simmenthals 130. The reciprocal of this is feed conversion which showed that between 200 and 400 kg mass, for example, the feed conversion in kg feed consumed/kg mass produced was 7,95; 6,17 and 5,35 and 13,32; 10,53 and 8,87 for Afrikaners, Herefords and Simmenthals on the concentrate and roughage diets respectively. Thus it can be concluded that there was no evidence of a breed-diet interaction and that the order of rank in efficiency of beef bulls on homogeneous diets is independent of energy concentration of the diet.

H-Ps.214/2:

**INTENSIVE BEEF PRODUCTION: MAIZE MEAL SUPPLEMENTATION
TO YOUNG STEERS ON VELD. 1968-1980**

H.J. van der Merwe, M. von la Chevalerie and
A.P. van Schalkwyk

The influence of two levels of nutrition during winter as well as maize supplementation at different stages of growth of summer veld on the growth and carcass quality of Hereford x Afrikaner steers, was investigated over one and two years respectively. The experiment was repeated thrice to eliminate seasonal differences and the average results of the three repetitions are summarized in Table 1.

TABLE 1 - The influence of level of nutrition during winter and maize supplementation on summer veld on the growth and carcass quality of steers

Item	Treatment							
	1	2	3	4	5	6	7	8
	S	SS	SS	SS	S	SS	S	SS
	N	N	N	MM	MM	MM	M	M
	A	A	O	O	A	A	A	A
First winter								
Initial mass (kg)	194,0	195,4	194,2	193,8	194,1	194,2	193,8	194,2
Final mass (kg)	287,5	284,9	202,7	199,6	294,5	292,0	294,1	288,1
Daily gain (kg/steer)	0,54	0,53	0,05	0,04	0,57	0,56	0,58	0,54
First summer								
Final mass (kg)	353,4	351,3	303,9	321,3	375,2	371,4	363,6	362,1
Daily gain (kg/steer)	0,45	0,45	0,69	0,82	0,55	0,54	0,47	0,50
Second winter								
Final mass (kg)	-	447,6	314,8	328,2	-	467,3	-	454,4
Daily gain (kg/steer)	-	0,45	0,05	0,04	-	0,44	-	0,43
Second summer								
Final mass (kg)	-	502,0	422,8	446,1	-	517,0	-	512,4
Daily gain (kg/steer)	-	0,43	0,80	0,89	-	0,39	-	0,45
Carcass mass (kg)	178,6	265,7	212,3	230,7	197,6	286,4	193,3	278,5
Dressing %	49,9	52,9	50,0	51,7	52,1	55,3	52,5	54,2
Grading (out of 20 points)	10,0	15,7	12,8	14,1	13,3	17,0	12,5	16,8
Ribeye area (mm ²)	4 733	5 799	5 229	5 507	4 933	6 162	5 263	6 262
Thickness of fat (mm)	2,6	6,4	4,4	4,5	3,8	7,6	3,0	7,5
S = Slaughtered after first summer N = No maize supplementation M = Maize supplementation for the last half of summer A = Above maintenance SS = Slaughtered after second summer MM = Maize supplementation for the whole summer O = Maintenance								

Wintering of steers above maintenance (0,57 kg/steer/day) showed a significant ($P < 0,01$) increase in live mass, carcass mass and carcass quality compared to wintering at maintenance. The daily supplementation of steers with maize at 1,4 kg for the first and 1,8 kg for the second summer, compared to no maize, resulted in a significantly ($P < 0,05$) heavier carcass mass for steers wintered above maintenance. Supplementation of maize resulted in an increased grading ($P < 0,01$) only when steers were slaughtered after the first summer. No significant ($P < 0,05$) differences in fat thickness and ribeye area occurred as a result of maize supplementation. Supplementation of maize only after semination of the summer grass compared to the whole summer did not influence results significantly. The highest yearly income above feed costs occurred where steers were wintered above maintenance, received maize for the last half of summer and were slaughtered after the first summer.

H-PS.214/4:

INTENSIVE BEEF PRODUCTION: EFFICIENCY OF INCREASING ENERGY LEVELS DURING THE FINISHING PERIOD OF BEEF CATTLE. 1976-1978
H.J. van der Merwe

Weaned Simmentaler steers were exposed at two fixed stages in the finishing period from 230 to 440 kg body mass, to an increased level of energy nutrition by substituting a maize meal ration for a maize silage ration. Four groups of ten steers each were utilized during each of the two years in which the investigation was carried out.

Group 1 received the maize silage ration only, and Group 4 only the concentrate ration. Groups 2 and 3 received the maize meal ration from 370 and 300 kg body mass respectively. All rations were fed *ad lib*. No significant differences occurred between the various treatments for DM-intake. In comparison with an all-silage ration a statistically ($P < 0,01$) higher daily live mass gain was observed for steers receiving the concentrate ration from 230 and 300 kg live mass. Feeding the concentrate ration from 370 kg live mass resulted in a significant ($P < 0,05$) and from 230 and 300 kg live mass a highly significant ($P < 0,01$) improvement in efficiency of feed conversion to carcass mass in comparison with an all-silage ration.

Silage quality differed during the two years of the experiment and appeared to influence dressing percentage and carcass grade. These characteristics were improved to a greater extent by the feeding of the high-concentrate ration where silage with a low (27 % on air-dry basis) rather than a high (48 % on air-dry basis) grain content was fed. Feeding of the high-concentrate ration resulted in significantly ($P < 0,01$) greater eye muscle area compared to the silage ration. Replacement of the good-quality silage (48 % grain) ration by the high-concentrate ration from 300 kg live mass resulted in the highest profit above feed costs, followed by the steers receiving a high-concentrate ration from 370 kg live mass.

REPRODUCTION

W.A. Coetzer:

REPRODUCTION IN CATTLE: AN INVESTIGATION OF PHYSIOLOGICAL AND HISTOLOGICAL ASPECTS OF THE POST PARTUM PERIOD IN AFRIKANER CATTLE
(Research Project O-Vh.71/3)
Ph.D. : University of Stellenbosch. 1979
Supervisor: Prof. Dr. C.H. van Niekerk

In the present study different aspects of the *post partum* period in *Bos indicus* (Afrikaner) was thoroughly investigated. Different techniques of estrus synchronization were studied in relation to consequent hormonal changes in comparison to the normal pattern.

From the first part of the project it was concluded that:

- Involutional changes of the uterus is mainly completed within the first 30 days after parturition. Most of the parameters studied showed a quadratic pattern of decrease. Regrowth of the uterine epithelium was completed at 36 days *post partum*. Under normal circumstances the uterus recovers sufficiently within 40 days *post partum* to accommodate a fertilized ovum.
 - Normally ovulation does not take place within the first 36 days after parturition. Although cyclic follicle growth does occur during this period, final ripening and ovulation is prevented, probably on account of low levels of the gonadotrophic hormones. As endocrine body, the *corpus luteum* of pregnancy becomes inactive within 24 hours after parturition and consequently does not play any role in the *post partum* anestrus period of the Afrikaner.
 - A marked change in the proportion of progesterone and total unconjugated estrogens occurs shortly before parturition. This change is attributed to the sharp decrease in progesterone concentration and not to an increase of the estrogens. As one of the contributing factors in the process of parturition, the decrease in progesterone concentration is consequently seen as the more determining factor.
 - The period after parturition is characterized by low progesterone levels (0,4-1,6 ng/ml). A significant increase in these values were only found shortly before the first observed estrus. On account of the short duration of this increase in progesterone concentration (5,5 days average), it is attributed to a silent ovulation and the formation of an inferior *corpus luteum*. However, a silent ovulation, followed by the formation of a *corpus luteum* with normal activity and lifespan, was also observed.
 - Under favourable conditions in the Northern Cape the first observed estrus in Afrikaner cattle normally occurs between 55 and 60 days after parturition.
- In the second phase of the study it was established that:

- Both the *post partum* anestrus period (PPAP) and reconception was positively influenced by early weaning of the calf. As these young calves demand intensive care, this practice can not be generally recommended under extensive farming conditions.
- Although indications were found that supplementary feeding before and during the breeding season may increase conception, such a practice will probably only be economically justified under poor feeding conditions. From the viewpoint of successful reproduction an increase in liveweight of the cow is probably the most important requirement during this period.
- By application of a progesterone/PMS treatment the PPAP of Afrikaner cattle was significantly reduced. On account of the relatively low and inconsistent conception rates experienced after treatment, this practice can not be generally recommended for lactating cattle.

Different techniques of estrus synchronization were also investigated during this phase. Results indicated that:

- Treatment with progesterone/PMS over a period of 10 days successfully suppressed estrus and resulted in a satisfactory estrus response after cessation of treatment. As conception at the synchronized estrus was generally low, this technique is not recommended for use in Afrikaner cows.
- Synchronization of estrus was also achieved by the administration of two high doses of progesterone followed by a single injection of 500 μ g prostaglandin analogue (PGF_{2 α}). Once again conception at the synchronized estrus was too low for general recommendation.
- From the view point of conception, the best results were obtained by the application of two injections of PGF_{2 α} , 11 days apart. However, application of this method is limited to cycling animals only.

In the final phase of the study it was concluded that:

- Progesterone levels during the normal estrus cycle of the Afrikaner displayed a high similarity with most overseas studies conducted on both beef and dairy cattle. A striking difference that needs confirmation, was a short lasting increase in the progesterone concentration which was observed 18 to 25 hours after the LH-peak in 2 of 3 experimental animals. Calculated on a time basis, this increase may probably be associated with ovulation.
- Increased LH-release during estrus lasted for less than 16 hours. The time of LH-release in relation to estrus showed a marked variation between individuals. As the time of ovulation is closely linked to the LH-peak, this variation may influence conception, especially in artificial breeding programmes.
- During synchronization with progesterone/PMS in two different seasons, blood progesterone concentration reached much higher levels during September in comparison to the more realistic values obtained during March. During both seasons the drop in progesterone concentration after cessation of treatment was linked to the stage of the estrus cycle at the commencement of the treatment. As this variation was successfully eliminated by a single PGF_{2 α} -injection, it is attributed to a *corpus luteum* action.
- Conception during the synchronized estrus could not be linked to plasma progesterone levels *per se*. The absence of an LH-peak during this estrus was, however, striking. As post-estrus increases of blood progesterone indicated successful ovulation after treatment, it is concluded that variable LH-release, and consequently also time of ovulation, probably plays an important role in the low conception rate experienced after this treatment in the Afrikaner.
- The sharp drop in plasma progesterone observed after a double PGF_{2 α} administration (11 days apart) confirms the luteolytic action of this substance. The changeability of LH-release during the synchronized estrus was, however, also observed with this technique in the Afrikaner. This phenomenon was not experienced in either Friesian or Hereford cattle. As information based on rectal palpation of the ovaries and blood progesterone levels indicated that post-treatment ovulation did take place in most of the Afrikaners studied, it was concluded that the pre-ovulatory LH-release was probably not detected on account of its "missynchronization" with behavioural estrus.
- Compared to *B. taurus* breeds, results from this study indicate that breeds of *B. indicus* origin probably display inherent differences with regard to the reproductive system. As these differences are connected with the hormonal control of the cycle, it probably contributes to the lower reproductive efficiency often experienced in these breeds. In the light of the increasing application of artificial breeding programmes, these differences need further investigation.

DAIRY CATTLE

NUTRITION

J. de K. van Dyk:

THE UTILISATION OF CAUSTIC SODA TREATED WHEAT STRAW
BY LACTATING DAIRY COWS.

(Research Project W-Eb.104/1)

M.Sc. (Agric.) : University of Stellenbosch. 1979

Supervisor: Prof. F.J. van der Merwe

The primary objective of this study was to determine to what extent caustic soda treated wheat straw (4 % NaOH) could be included in the diets of lactating dairy cows. The following two aspects received attention:

- The digestibility of caustic soda treated wheat straw.
- The influence of caustic soda treated wheat straw on the feed intake, milk production and composition of milk of lactating dairy cows.

The same four diets were used in the two studies. The composition of the four diets are given in Table 1.

TABLE 1 - Composition and nutritive value of four experimental diets (natural moisture basis)

Feeds	Diets			
	A	B	C	D
Maize meal	38	32	26	20
Oat hay	47	31	16	0
Caustic soda treated wheat straw	0	20	40	60
Fishmeal	5	5	5	5
Sunflower oil cake meal	10	12	13	15
Digestible energy (MJ/kg)	11,1	11,0	10,9	10,8
Crude protein (%)	12,6	12,6	12,5	12,5

Digestibility studies

Four first lactation Friesland cows from the stud of the Elsenburg Agricultural College were used in a change-over experimental design.

The crude fat content of the diets differed significantly ($P < 0,05$) and varied from 16,7 % (Diet A) to 23,3 % (Diet D). This was accompanied by a corresponding significant increase in cellulose content of the diets (from 15,2 to 23,0 %). The ash content differed highly significantly ($P < 0,01$) and varied from 5,0 % (Diet A) to 9,8 % (Diet D). This was due to an increase in sodium and potassium content of the diets from 4,4 in diet A to 18,7 g/kg in diet D and 7,5 to 14,5 g/kg respectively. The increased sodium content was the result of caustic soda addition, while the potassium increase originated in the wheat straw. The crude protein, crude fat, cell walls, hemicellulose, calcium, phosphorus and magnesium contents did not differ significantly.

Dry matter intakes did not differ significantly (average 125,8 g/kgW^{0.75}/day), while the intakes of sodium and potassium increased in accordance with an increase in caustic soda treated wheat straw. The excessive sodium and potassium were excreted through the urine. In the case of diet A the sodium and potassium excretions were 12,0 and 20,2 g/100 kgW/day respectively. The corresponding figures for diet D were 50,5 and 39,4 g/100 kgW/day. These differences were highly significant.

The apparent digestibility of energy (and TDN) did not differ significantly between diets (average 63,6 %). The apparent digestibility of crude fibre differed highly significantly between diets. The digestibility increased from 39,1 % in diet A to 64,0 % in diet D. This was attributable to an increase in apparent digestibility of cell walls from 46,0 to 64,1 %, hemicellulose from 53,9 to 73,3 % and cellulose from 37,1 to 64,0 %. The digestibility of lignin was not affected. The apparent digestibility of sodium and potassium showed a corresponding increase, but that was due to an increase in excretion of sodium and potassium in the urine.

The fat, protein, energy, calcium, phosphorus, sodium, potassium and magnesium contents of the milk of the cows did not differ significantly between diets. The averages were 3,46 %, 3,34 %, 2,985 MJ/kg, 1007 mg/kg, 996 mg/kg, 323 mg/kg, 1455 mg/kg and 96 mg/kg respectively.

The TDN value of caustic soda treated wheat straw was calculated as 68,4 % (moisture free basis) by means of the subtraction method.

Intake and production studies

Twelve Friesland cows from the stud at the Elsenburg College of Agriculture were divided into six blocks of two each according to amount of lactation already completed and expected date of calving. Each cow was admitted to the study five weeks after calving after which she underwent three 10-week experimental periods. During these periods each cow received two diets in a balanced change-over experimental design. Each cow received the first diet during the first 10-week period, after which she received the second diet and then the first diet again.

Dry matter intakes did not differ significantly between diets. The average intake was 127,6 g/kgW^{0,75}/day or 15,2 kg/day. The diets were acceptable to the cows.

Average daily milk production (or fat corrected milk production) did not differ significantly between diets (average 18,2 kg/day).

The fat, protein and lactose contents of the cows' milk, as well as the daily production of these components, did not differ significantly between diets. The averages for the fat, protein and lactose contents were 3,56; 3,46 and 4,73 % respectively, while the daily productions were 605, 584 and 824 g/day respectively.

The mineral content of the plasma of the cows, taken at the end of each 10-week period, did not differ significantly between diets. The average figures for calcium, phosphorus, sodium, potassium and magnesium were 105; 80; 3481; 187 and 24 ppm respectively.

The live mass of the cows did not differ significantly during any period between the diets (average 598 kg).

Conclusions

- The use of up to 60 % caustic soda treated wheat straw in the diets of lactating dairy cows did not have any adverse effects of feed intake, milk production or milk composition.
- A cow will excrete 108 kg sodium and 75 kg potassium yearly if she receives up to 60 % caustic soda treated wheat straw. This can lead to a serious increase in the salinity of the soil under certain conditions.
- The price of diets A, B, C and D were R118,98; R114,52; R109,06 and R104,60 per ton respectively. The use of caustic soda treated wheat straw can lead to a decrease in price of the diets under certain circumstances.

GENERAL**NUTRITION**

O-GI.125/6:

EVALUATION OF THE NUTRITIVE VALUE OF ROUGHAGES AND PASTURES: NUTRITIVE VALUE OF FERTILIZED AND UNFERTILIZED ROUGHAGES FOR SHEEP AND CATTLE.
1965-1980

J.A. Swart, E.A.N. Engels and L.C. Biel

The Nutritive Value Index (NVI) of Crampton, Donefer & Lloyd (1960) is based on the postulate that nutritive value of forages for ruminants mainly depends on the voluntary intake of dry matter per unit body size and the digestibility of the gross energy of the forage. Swart, Niemann, Engels, Baard & Biel (1969) pointed out that the NVI of silages could be improved by nitrogen fertilization of the crop from which the silage was made. The present experiment was conducted mainly to investigate the effect of nitrogen fertilization on the nutritive value of different types of roughage.

The kinds of roughage fed to the animals were the following:

- (1) Maize cobs and maize stover produced under dryland conditions at Glen or under irrigation at Sand-Vet. The forages were either not fertilized with nitrogen or fertilized with 32 kg N per ha at Glen or 42 kg N per ha at Sand-Vet. The maize cultivar was PP x K64.
- (2) Sweet sudan and *Eragrostis teff* produced at Glen under dryland conditions and either not fertilized with nitrogen or fertilized with 32 kg N per ha.
- (3) Lucerne hay produced under irrigation at Rietrivier Research Station. The control crop received 22 kg P per hectare while the experimental crop received no P fertilization.

The maize was cut at the hard dough stage and stacked to dry. The fertilized maize yielded approximately the same percentage of grain as the unfertilized maize. Of each batch half was randomly selected and the cobs were fed as maize straw after thrashing. Teff was cut at the early dough stage and sun cured. The fertilized hay yield, comprising 26,5 % leaves, was 5 830 kg per ha. The unfertilized hay yielded 5 618 kg dry matter per ha and contained 25,7 % leaves.

Sweet sudan was cut in the late dough stage and lucerne was cut at the 10 % bloom stage. The fertilized lucerne produced 45 % more hay than the unfertilized. Wethers or oxen were placed in metabolism cages and fed the chopped roughage. An adaptation period of seven days was followed by an experimental period of ten days. Eight wethers and four oxen were used for the measurement of feed intake and digestibility studies. All animals were fed at a constant refusal margin of 15 % according to the method of Blaxter, Wainman & Wilson (1961). Each sheep received about 30 grams of dicalcium phosphate and salt (mixed in equal parts) daily.

Statistical analyses were carried out according to the method of Student-Newman-Keuls (Steel & Torrie, 1960).

The chemical composition of the different kinds of roughage are presented in Table 1.

TABLE 1 - The chemical composition of the roughages

Hay type	DM ¹ %	OM ² %	Gross energy kJ/g	Cellulose %	Crude Fibre %	Nitrogen %
Maize stover, Glen, N ₀ ³	90,3	93,7	19,05	23,4	21,0	1,25
Maize stover, Glen, N ₁ ⁴	89,9	94,3	19,30	22,9	21,1	1,24
Maize stover, Sand-Vet, N ₀ ³	92,3	93,5	17,33	28,0	26,2	0,97
Maize stover, Sand-Vet, N ₁ ⁴	91,0	92,5	17,21	25,9	25,6	1,35
Maize cobs, Glen, N ₀ ³	90,6	87,4	17,46	30,6	34,1	0,75
Maize cobs, Glen, N ₁ ⁴	91,4	90,1	18,30	35,8	37,4	0,75
Maize cobs, Sand-Vet, N ₀ ³	91,9	91,6	16,87	38,2	37,9	0,62
Maize cobs, Sand-Vet, N ₁ ⁴	92,2	92,2	16,37	37,8	36,3	1,15
Sweet sudan, Glen, N ₀ ³	91,7	92,3	18,25	33,9	33,3	1,09
Sweet sudan, Glen, N ₁ ⁴	92,4	93,1	18,21	33,2	32,4	0,97
Teff, Glen, N ₀ ⁴	89,8	94,5	17,54	33,6	38,7	1,12
Teff, Glen, N ₁ ⁴	89,4	93,8	17,92	33,5	38,2	1,48
Lucerne, Rietrivier, P ₀ ⁵	92,2	84,0	17,23	32,3	28,5	2,35
Lucerne, Rietrivier, P ₁ ⁶	95,8	89,1	18,14	30,1	27,9	2,79

DM¹ = Dry matter

OM² = Organic matter

N₀³ = No nitrogen fertilization

N₁⁴ = Fertilized with 32 kg N per ha (42 kg N/ha at Sand Vet)

P₀⁵ = No phosphorus fertilization

P₁⁶ = Fertilized with 22 kg P per ha

From Table 1 it is clear that the maize grown under irrigation at Sand-Vet had an increased nitrogen content in both the stover and the cobs after fertilization with 42 kg N per hectare. The maize cultivated at Glen under dryland conditions showed no apparent response to N fertilization. The N content of teff grown at Glen under dryland conditions was also increased by N fertilization. A relatively small increase in N content was noted in lucerne hay fertilized with phosphorus.

Results pertaining to the Relative Intake (RI) and NVI with respect to cattle and sheep fed fertilized and unfertilized maize fodder are presented in Table 2.

Although maize fodder produced under dryland conditions at Glen was not influenced by N fertilization with respect to RI and NVI for both cattle and sheep, the response at Sand-Vet proved of such an extent that overall RI was improved. Maize cobs were affected to a larger extent than the maize stover.

In order to ascertain whether N fertilization had an overall effect on the nutritive value of a number of forages produced under dryland conditions the RI, NVI, coefficients of digestion and nitrogen balance of a number of roughages fed to sheep were compared. These results are presented in Table 3.

Summaries

GENERAL

TABLE 2 - RI and NVI of fertilized and unfertilized maize straw and maize hay grown at Glen and Sand-Vet and fed to cattle and sheep

Roughage	Maize stover		Maize cobs		Average
Locality	Glen	Sand-Vet	Glen	Sand-Vet	
Relative intake cattle (RI)					
	%	%	%	%	%
N ₀ ³	86	67	48	39	60,1
N ₁ ⁴	88	72	52	55	66,7*
Relative intake sheep (NVI)					
N ₀ ³	75	84	55	44	64,5
N ₁ ⁴	73	87	57	63	70,0
NVI cattle					
N ₀ ³	53	42	29	24	37,1
N ₁ ⁴	53	49	30	36	42,0*
NVI sheep					
N ₀ ³	51	53	31	25	40,0
N ₁ ⁴	50	52	32	32	41,5

* Differences between the two mean values are significant at the 5 % level.

TABLE 3 - Relative intake, Nutritive Value Index, coefficients of digestibility and nitrogen balance (N-balance) of fertilized and unfertilized hays fed to sheep

Component	Fertilization	Maize stover		Maize cobs Glen	Sweet sudan Glen	Teff Glen	Mean	
			Glen					
RI ²	N ₀ ³	%	75,0	55,6	65,0	69,5	66,3	(1)
	N ₁ ⁴	%	72,6	56,7	61,4	72,0	65,7	NS
NVI ⁴	N ₀ ³	-	51,1	31,4	33,5	40,1	39,0	
	N ₁ ⁴	-	49,7	32,4	32,7	41,3	39,0	NS
DM ⁵	N ₀ ³	%	67,1	53,7	51,7	58,8	57,8	
	N ₁ ⁴	%	67,9	57,1	54,0	56,9	59,0	NS
OM ⁶	N ₀ ³	%	69,4	58,7	53,9	61,6	60,9	
	N ₁ ⁴	%	67,4	59,3	56,3	60,0	60,7	NS
Energy	N ₀ ³	%	68,3	56,5	50,3	58,7	58,5	
	N ₁ ⁴	%	68,7	56,6	54,2	57,0	59,1	NS
Cellulose	N ₀ ³	%	62,6	56,9	51,0	67,3	59,5	
	N ₁ ⁴	%	59,3	65,7	52,6	65,6	60,8	NS
Crude fibre	N ₀ ³	%	64,0	64,5	50,1	64,8	60,9	
	N ₁ ⁴	%	61,7	67,4	52,3	63,9	61,3	NS
Nitrogen	N ₀ ³	%	52,6	28,1	39,1	51,3	42,8	
	N ₁ ⁴	%	47,7	33,8	39,7	57,0	44,5	NS
N-balance	N ₀ ³	g/day	+4,2	-4,2	+1,9	+3,7	+1,4	
	N ₁ ⁴	day	+4,5	-3,1	+2,5	+3,8	+1,9	NS

1 Significance of differences : NS = not significant at P<0,05

2 RI = Relative Intake

3 N₀ = No nitrogen fertilization; N₁ = 32 kg N/ha

4 NVI = Nutritive Value Index

5 DM = Dry matter

6 OM = Organic matter

No significant differences due to the fertilization of the crops with nitrogen were observed.

Figures summarizing the nutritive value of lucerne fertilized with phosphorus as against unfertilized lucerne are given in Table 4.

No significant differences were found except in the case of nitrogen balance where the unfertilized hay produced a significantly higher N-balance.

Although nutritive value of lucerne hay was not influenced by the provision of phosphorus to the soil, the drastic increase of 45 % in the dry-matter yield made it a worthwhile practice.

TABLE 4 - The RI, NVI, Coefficients of digestibility and N-balance of phosphorus fertilized and unfertilized lucerne hay fed to sheep

Component		P ₀	P ₁	P < 0,05
Relative Intake	%	94,1	94,6	NS
Nutritive Value Index		61,1	56,8	NS
Digestibility of Dry matter	%	59,6	62,1	NS
Digestibility of Organic Matter	%	63,0	63,6	NS
Digestibility of Gross energy	%	64,5	60,0	NS
Digestibility of Cellulose	%	69,4	63,8	NS
Digestibility of Crude fibre	%	56,5	51,4	NS
Apparent digestibility of nitrogen	%	73,2	72,2	NS
Nitrogen balance	g/day	+8,9	+3,4	*

From the results of these experiments it would seem as if the fertilization of crops with nitrogen under dryland conditions has no influence on the nutritive value of the hays. However, under irrigation the situation seems to be different except in the case of maize stover where very little or no response was observed.

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OSTRICHES

INTERNAL PARASITES

W-Sb.144/4: DOSING OF OSTRICHES. 1974-1978
 C.J. Nel

Prior to 1974 when a campaign was launched to encourage farmers to dose both chicks and adult birds regularly, the rate of ostrich chick mortality as a result of tape worm (*Houttuynia struthionis*) and wire worm (*Libyostrongylus douglassii*) infestation was as high as 40 %. By 1978 this figure had dropped to below 5 %.

PIGS

NUTRITION

(A)Vs-Pr.67/3: INFLUENCE OF DIETARY ENERGY CONCENTRATION, FED AT A CONSTANT DIETARY PROTEIN CONTENT, ON THE GROWTH RATE, BODY COMPOSITION AND FEED COMPONENT UTILIZATION OF GROWING PIGS. 1975-1980
 E.H. Kemm

The effect of dietary energy density on the ME-intake, growth, body composition and ME-utilization of *ad libitum* fed pigs was studied. Fifty-two castrates, fed one of five diets from eight weeks of age onwards were used. All the diets were compounded to contain 20 % crude protein, but with ME content of 17,0; 15,6; 14,0; 12,9 and 11,5 MJ/kg DM. Pinewood sawdust was used as an energy diluent. Pigs on any one treatment were slaughtered, one at a time at two weekly intervals from 11 to 31 weeks of age, and their bodies chemically analysed. The Roux mathematical model was used to analyse the data.

The results on feed and ME intakes, gains in live mass, utilization efficiencies of ME consumed and body protein and fat contents at a live mass of 45 and 90 kg respectively are presented in Table 1.

The results show that increased feed consumption could not compensate fully for energy intake when dietary ME content was reduced to 14 MJ/kg DM. Hence dilution of dietary energy content retarded growth rate and improved carcass quality through a rapid reduction in fat deposition relative to protein gain, which in turn decreased in a pattern very similar to live mass gain. Body protein content remained fairly constant when calculated at a specific body mass, increasing slightly when the two low-energy treatments were fed. Body-fat content was, however, drastically reduced by diluting the dietary energy content.

TABLE 1 - Estimated feed and ME intakes, gains in live mass, utilization efficiencies of ME consumed and body protein and fat contents

Live mass (kg)	45					90				
Treatment No.	1	2	3	4	5	1	2	3	4	5
Diet ME, MJ/kg DM	17,0	15,6	14,0	12,9	11,5	17,0	15,6	14,0	12,9	11,5
Voluntary air-dry feed intake, kg/day	2,0	2,2	2,2	2,1	2,4	2,2	2,4	2,4	2,2	2,4
Voluntary ME-intake, MJ/day	30	30	27	24	24	33	34	30	25	24
ME-utilization, MJ/kg gain	43	42	42	45	48	59	58	58	62	66
Daily live-mass gain, g/day	697	718	637	533	510	558	585	515	410	365
Body protein content, kg	6,9	6,8	6,8	7,1	7,3	12,5	12,4	12,5	12,9	13,4
Body-fat content, kg	8,9	8,1	7,1	7,2	6,0	30,6	28,1	27,0	28,5	25,0
Ratio of fat: protein in body, kg/kg	1,3	1,2	1,1	1,0	0,8	2,4	2,3	2,2	2,2	1,9

(A)VS-Pr.67/4:

EVALUATION AND STANDARDIZATION OF PIG DIETS UNDER
SOUTH AFRICAN CONDITIONS: THE QUANTIFICATION OF THE
EFFECTS OF WET VERSUS DRY FEEDING ON THE BACONER.
1976-1979

F.K. Siebrits, E.H. Kemm and M.N. Ras

The study was conducted to quantify the effects of wet versus dry feeding on the daily gain, feed conversion, carcass composition and carcass quality of the baconer.

A metabolism trial was conducted using 12 barrows in two replicates to determine whether the addition of water to feed had an effect on digestibility and to determine the metabolizable energy content of the two diets used. The high-protein diet (H.P.) contained 16,21 % and the low protein diet (L.P.) 13,88 % crude protein on an as-is basis. Both diets were fed either dry or wet (with 2,5 kg of water added per kg feed). Significant differences were found between diets but not between wet or dry feeding. The digestible and metabolizable energy contents of the two diets differed significantly. Nitrogen digestibility did not differ significantly between diets while nitrogen balance did. The H.P. groups retained 21,145 g and the L.P. groups retained 18,485 g nitrogen per day.

A growth trial was conducted with 80 Landrace x Large White barrows. The pigs were fed according to the auto-regression model of Roux. Values for ρ and α of 0,9393 and 9,1946 respectively were used for calculation of feed intake. The quantity of feed for each pig was adjusted weekly according to the Roux model which describes feed intake on a time basis. The pigs' live masses and actual feed intakes were measured weekly.

Regression equations were computed between cumulative ME intake and live mass as well as the auto-regressions of cumulative ME intake and the auto-regressions of live mass where a time factor was taken into account. Pigs fed the L.P. diet grew according to the same ρ value to which they were fed, while the pigs fed the H.P. diet grew according to a different ρ value (0,9401 as compared with 0,9211 respectively).

One half of the pigs on each treatment were slaughtered two weeks after commencement of the growth period (at the age of 14 weeks) while the others were kept on the different treatments up to a live mass of 85 ± 3 kg and then slaughtered. The carcasses were halved after cooling and backfat measurements taken. Half of each carcass was frozen, ground and analysed chemically.

Regression equations were calculated between cumulative ME intake and carcass mass, carcass fat measurements and carcass protein, fat, moisture, ash and energy content respectively. Daily live mass gain, daily deposition of the different chemical carcass components, carcass composition and efficiencies were calculated from the regression equations at different live masses.

From the results it seems that the pigs fed the L.P. diet received adequate quantities of protein and lysine and that a diet containing 14% crude protein supplies enough protein for barrows. No significant differences regarding daily gain and carcass compositions were found between wet or dry-fed pigs receiving the H.P. diet. Pigs fed the L.P. diet in a dry form, yielded fatter carcasses than the pigs fed the same diet wet. This phenomenon might be ascribed to the fact that the L.P. dry group had heavier carcasses at specific live masses.

A better correlation was found between carcass fat measurements and carcass fat content than between carcass fat measurements and cumulative ME intake. Carcass energy was better correlated with carcass mass than with cumulative ME intake.

While carcass protein content remained relatively constant, carcass fat content increased and carcass moisture content decreased as the pigs grew heavier. The rate of protein deposition reached a peak at a live mass of about 75 kg and then decreased slightly.

The pigs fed the L.P. diet were more efficient in terms of the amount of energy ingested per unit deposited as well as in terms of the amount of protein ingested per gram protein deposited. The L.P. dry group deposited energy more efficiently than the L.P. wet group, apparently because the L.P. dry group deposited more fat which contains more energy.

It can be concluded that wet versus dry feeding does not produce differences of practical and economic importance and that producers may choose the system that ensures the easiest and most accurate handling of feed.

An example of how the Roux mathematical model can be used to manipulate carcass quality and composition is given.

- (A)VS-Pr.87/4: THE OPTIMAL INCLUSION RATE OF SUNFLOWER OILCAKE MEAL AND LYSINE IN PIG GROWTH DIETS. 1978-1979.
F.K. Siebrits, E.H. Kemm and M.N. Ras

Thirty-five diets (including seven rates of sunflower oilcake meal between 15 and 33 %, each with five lysine levels between 0,7 and 0,9 %) consisting of sunflower oilcake meal, maize meal and synthetic L-lysine together with the necessary minerals and vitamins were fed to 35 Landrace x Large White boars. The pigs were kept separately and had *ad lib* access to the diets from the age of eight weeks up to a live mass of about 50 kg.

The inclusion rate of sunflower oilcake meal had no significant effect upon growth rate or efficiency of energy utilization. Increased lysine levels, however, improved growth rate and efficiency in a non-linear way. Although protein level varied between 13,9 and 19,1 %, it had no significant effect ($P < 0,05$) on growth rate or efficiency of energy utilization. The inclusion rate of sunflower oilcake meal also had no effect on carcass measurements while lysine level did have an effect. Both sunflower oilcake meal and lysine inclusion rates had a significant effect ($P < 0,01$) on feed conversion. The best feed conversions were attained at the lowest inclusion rate of sunflower oilcake meal.

- W-Eb.101/5: EVALUATION OF FISH SILAGE AS A SOURCE OF PROTEIN IN THE DIETS OF GROWING PIGS. 1979
N.M. Kritzinger

A growth trial using 48 pigs (24 sows and 24 barrows) was conducted to study the effects of increasing levels of fish silage in pig finisher diets, on the growth performance and certain carcass characteristics of baconer pigs. Eight levels of fish silage (0, 1, 2, 3, 4, 5, 6 and 7 % on an air-dried basis) were used to replace fish meal in the iso-nitrogenous treatment diets containing 16,0 % crude protein. Each treatment had 8 replicates. The diets were individually and restrictively fed (maximum of 2,0 kg air-dried feed per day) to pigs from an initial live mass of 40 kg up to a slaughter mass of 85 kg. The carcass mass, eye muscle area, C + K measurement, loin and back fat thickness were determined while the growth rate, feed utilisation and dressing percentage for each pig were calculated. To evaluate the effect of fish silage level on the meat flavour of baconers, flavour tests were carried out on hams from two groups of four pigs each, each receiving diets containing 0,3 and 7 % fish silage respectively.

The level of fish silage in the diet had no significant effect on the growth performance or carcass characteristics of the pigs studied, nor had it any significant effect on the meat flavour. The results indicate that when fed restrictively, fish silage can replace all of the protein supplied by fish meal without adverse effects on the growth rate, feed efficiency, carcass quality or meat flavour of baconer pigs.

WOOLLED SHEEP

NUTRITION

- H-Ps.225/6: INTENSIVE MUTTON PRODUCTION FROM WOOL-BEARING SHEEP: FATTENING OF SHEEP ON RATIONS CONTAINING HIGH CONCENTRATIONS OF HUSKED MAIZE EAR MEAL. 1970-1972
C.G. Coetzee, M. von La Chevallier, H.J. v.d. Merwe and A.J. van Heerden

Elderly Merino-type wethers were used in this study. Groups consisting of 20 animals each were subjected at random for a period of 35 days to the treatments as indicated in Table 1.

TABLE 1 - Experimental rations for the fattening of elderly Merino wethers during 1970 and 1971 (percentage ratios of basic ration : grass hay)

Week	Experimental ration								
	1	2*	3	4	5	6	7	8	9
1	100:0	100:0	70:30	90:10	70:30	80:20	70:30	70:30	Control
2	100:0	100:0	80:20	90:10	80:20	80:20	80:20	70:30	
3	100:0	100:0	90:10	90:10	90:10	80:20	80:20	70:30	
4	100:0	100:0	100:0	90:10	90:10	80:20	80:20	70:30	
5	100:0	100:0	100:0	90:10	90:10	80:20	80:20	70:30	

* Grass hay supplied *ad lib.* in separate container.

The basic ration consisted of 97 % maize ear meal, 1,5 % biuret and 1,5 % limestone and was fed in various combinations with grass hay according to the treatments as indicated in Table 1.

The results of the study are summarised in Table 2.

TABLE 2 - Summary of results obtained when feeding rations with a high ear maize content to elderly Merino wethers

Group Item	1	2	3	4	5	6	7	8	Stat. P0,05	diff. P0,01	CV %
Mean DMI (kg/sheep)	43,35	52,20	43,60	43,35	46,90	45,25	47,45	46,80	-	-	46,11
Growth rate (g/day)	137	188	108	151	137	152	151	122	3>rest	3>2	26,80
Carcass mass (kg)	19,50	20,60	19,45	20,68	19,40	20,14	19,41	18,46	-	-	6,7
Grading out of 10	6,2	6,3	5,7	6,0	5,7	5,5	6,0	6,2	-	-	9,4
Feed conversion to live mass (kg/kg)	8,79	7,92	11,18	8,15	9,83	8,59	9,00	10,88	-	-	-
Income over feed cost (1)	13,97	14,28	14,00	14,38	13,87	14,20	14,04	13,82	-	-	-
Income over feed cost and initial value (2)	3,96	4,27	3,99	4,37	3,86	4,19	4,03	3,81	-	-	-

DMI - Dry matter intake

CV - Coefficient of variation

(1) - Price of mutton : 96 c/kg for Grade 1 (minimum producers' price)

(2) - Initial value = R10,01 (70 c/kg x 14,30 kg)

It is clear from Table 2 that a low coefficient of variation occurred as far as feed intake was concerned. Group 2 had a slightly higher intake compared to the other treatments.

Dry matter intake resulted in a significantly lower ($P<0,05$) daily growth rate for Group 3 compared to the other treatments, while Group 3 also had a highly significantly ($P<0,01$) lower daily growth rate than Group 2. No significant differences between treatments were recorded for carcass characteristics.

With a mean ration cost of 3,02c/kg dry matter and a mean carcass mass of 17,50 kg, the profitability of fattening elderly sheep will depend on ruling market prices for mutton. From Table 2 it is evident that a good profit is possible at the minimum producers' price for mutton. Care has to be exercised not to fatten elderly sheep in a fairly good condition since a financial loss may result. An improvement of at least one in carcass grade is essential, always taking into consideration the initial condition of the sheep.

Since maize ear meal is a concentrated ration, special care must be taken in feeding a ration of this kind.

It is concluded that rations containing high percentages of maize ear meal can be used for the fattening of elderly sheep.

H-PS.225/8:

INTENSIVE MUTTON PRODUCTION FROM WOOLLED SHEEP: THE EFFECT OF PROTEIN CONTENT OF SUPPLEMENTARY CONCENTRATES FED TO EARLY-WEANED LAMBS GRAZING WINTER CEREAL PASTURE. 1974-1976
A.J. van Heerden

The relatively high protein content of winter cereal pasture raised the question whether it is feasible to supplement the pasture with other protein components. Therefore maize meal and protein-enriched maize meal were fed *ad lib* to early-weaned Dohne merino lambs on winter cereal pasture. The pasture consisted of a 50 : 50 mixture of *Triticum vulgare* (winter wheat) and *Secale cereale* (stooling rye) which was planted annually during March.

Ram lambs were slaughtered at a live mass of 32 kg and the carcasses evaluated.

Analysis of the feed samples showed that the protein content during the early vegetative stage was in the region of 30 %. As was expected, the lowest crude protein values were obtained during September. Average figures indicated that only during this period was the protein content insufficient for finishing fat lambs.

There were marked differences between single and twin-born lambs (Table 1). Single lambs were heavier ($P<0,01$) at birth than twin lambs. Single lambs also showed a higher ($P<0,01$) growth rate during the pre-weaning period. Average daily gains of the single and twin groups did not differ significantly for the post-weaning period.

TABLE 1 - Effect of status of birth on the growth rate of Dohne merino lambs

	Single (S)	Twin (T)	Significance * $P<0,05$ ** $P<0,01$
Birth mass (kg)	4,81	4,21	**S>T
Pre-weaning period (days)	51,9	67,4	**T>S
ADG pre-weaning (g)	217,9	170,2	**S>T
Post-weaning period (days)	100,4	101,6	NS
ADG post-weaning (g)	177,6	170,9	NS

NS = not significant

ADG = average daily gain

The lambs which received the protein-enriched maize meal grew better than the control and maize meal groups respectively and took less time ($P<0,01$) to reach slaughtering mass (Table 2).

TABLE 2 - Effect of the supplementing of winter cereal pasture with concentrates on intake, growth rate, carcass characteristics and economy of fat-lamb production

	WCP + O	WCP + maize	WCP + maize + H P C	Significance * $P<0,05$ ** $P<0,01$
Finishing period (days)	108,6	101,8	92,6	**1,2>3
ADG Finishing period (g)	157,5	172,2	192,9	**3,2>1
Carcass mass (kg)	13,4	13,5	13,5	NS
Dressing percentage (%)	41,9	42,3	42,5	NS
Total carcass score (out of 100)	50,23	55,37	53,62	*2>1
Buttock circumference : Buttock length	2,12	2,51	2,15	NS
Carcass income/lamb (Rc)	18,76	18,90	18,90	-
Pasture cost/lamb (Rc)	3,89	3,56	3,50	-
Supplementary cost/lamb (Rc)	-	2,96	4,31	-
Margin above feed cost (Rc)	14,87	12,38	11,09	-

WCP = winter cereal pasture

HPC = high protein concentrate

NS = not significant

ADG = average daily gain

Only a few differences occurred as far as carcass score is concerned. Carcasses of the maize meal group obtained a higher ($P<0,05$) score than did the control group. The supplemented groups also obtained a higher ($P<0,05$) score for fat covering on the eye muscle. No other differences occurred in dressing percentage, width and depth of eye muscle, fat covering and fleshing.

Although there was a tendency to poorer growth performance for the control group, it yielded the highest margin above feed cost.

SHEEP GENERAL

NUTRITION

- A)VS-Pr.26/6: THE UTILIZATION OF STAREA AS ONLY NITROGEN SUPPLEMENT
IN A PRODUCTION DIET. 1977-1979
L.H.P. Liebenberg

Eight sheep with rumen cannulae were used in a trial to study the influence of starea as a nitrogen supplement. A basal diet consisting of 50 % maize meal, 39 % maize straw, 10 % molasses and 1 % vitamins and minerals was supplemented with 10-16 % "starea" to increase the crude-protein concentration of three experimental diets from 72 to 117, 132 and 166 g crude protein/kg of feed respectively. The diets were fed *ad libitum* at 6-hourly intervals. The daily voluntary intakes (grams DM) were measured. Rumen ammonia concentrations were measured at 1, 3 and 6 hours after feeding.

The results indicate that voluntary intakes were suppressed by higher levels of starea supplementation. Rumen ammonia concentrations of the diets decreased rapidly from feeding to 6 hours after feeding. Only until one hour after feeding of the basal diet were the rumen ammonia concentrations near the minimum value (50 mg/l) of Satter & Roffler (1975) to ensure maximum ruminal microbe production.

After one hour the values were much lower on the basal diet, indicating a possible deficiency of ruminal nitrogen. All the other crude protein levels gave rumen ammonia concentrations above 50 mg/l for the total period between feedings.

From the results it is concluded that "starea" is possibly no better than other NPN sources. Rumen ammonia concentrations indicated that a basal maize diet supplemented with starea to a crude-protein level of 117 g/kg feed is sufficient to ensure maximum microbe production in the rumen. Higher levels of "starea" only increased the ruminal ammonia with subsequent inefficient nitrogen utilization by the animal.

- (A)VS-Pr.93/1: EVALUATION OF THE *IN-VITRO* DIGESTIBILITY OF THE
ORGANIC MATERIAL OF A WIDE VARIETY OF LOW-QUALITY
FEEDSTUFFS AND FIBRE-RICH WASTE PRODUCTS IN SOUTH
AFRICA, AFTER TREATMENT WITH DIFFERENT
CONCENTRATIONS OF SODIUM HYDROXIDE. 1974-1978
H.S. Hofmeyr

The growing demands of the ever-increasing population of the world have necessitated restrictions on the amount of grain used by ruminant animals. As only ruminants are able to utilize the energy of low-quality roughages, it is of paramount importance that the energy in roughages be utilized to the utmost. Not all this energy is available to the ruminant, but treatment with different types of chemicals tends to increase the availability.

Chemicals such as sodium carbonate, hydrogen peroxide, ammonia, chlorine and sodium hydroxide were tested. Of these sodium hydroxide and ammonia seemed the most promising.

Addition of 5 % NaOH increased the energy digestibility of a roughage from 40-60 percentage units. The same results could be obtained by using 2-3 % NH_3 .

Acceptability to the animals of such treated roughages seemed not to present a problem.

Live mass gains of sheep under experimental conditions ranged from 79 g/day for sheep on untreated diets to 213 g/day when roughages were treated with 5 % NaOH.

New developments in this field include:

- Digestion and absorption of NaOH-treated materials.
- Improved economics of treating materials with NaOH.
- Long-term effect of treated materials on animals.
- Storage of NaOH-treated roughages with emphasis on wet storage.

The inclusion of up to 72 % NaOH-treated wheat straw in growth diets for lambs rendered the same mass gain when compared to a normal growth diet.

For maximum growth and feed conversion up to 50 % of the fattening diet for cattle may consist of NaOH-treated roughage.

If a commercial dairy meal costs R80/ton, the price for 5 % NaOH-treated wheat straw should not exceed R54,74/ton.

The dangers of NaOH as a chemical are discussed as well as treatment in the case of contamination.

Different types of machines capable of treating roughages with NaOH were developed.

Problems such as moisture content of the treated materials, treatment capacities of the different machines, safe handling of caustic soda and storage of the treated material still prevail in some cases.

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(A)VS-Pr.93/3: THE INTAKE AND PARAMETERS RELATED TO THE PARTIAL DIGESTION OF NaOH TREATED KIKUYU HAY IN LAMBS.
1975-1980
P.J.K. Morgan

The first task was to develop a rubber cannula suitable for fitting into the duodenum and ileum of lambs, sheep and goats in long term experiments. The second aim was to measure microbial growth in the rumen and other measurements related to nitrogen digestion when untreated or 6,6 % NaOH treated grass was offered to lambs. The most important result is that rumen NH_3N concentration limited the treated roughage intake (Table 1). When this was corrected, the intake of digestible organic matter was similar to good quality chopped lucerne hay. Thus the treatment allowed lambs of 21 kg fleece free body mass to gain 186 g/day which was 4 times greater than when they were offered the untreated hay. Nitrogen retention was similarly affected.

TABLE 1 - The effect of untreated (K) or 6,6 % NaOH treated (KN) grass on measurements related to nitrogen digestion

Measurement	Diet	
	K	KN
Rumen NH_3 level before urea infused <i>per rumen</i> (mg N/l)	87	10
Intake before urea infused (g OM/kg BM)	28,9	21,2
Partial digestion results		
Rumen NH_3 level after urea (mg N/l)	146	66
Intake after urea infused (g OM/kg BM)	29,1	35,7
Body mass gain (g/day)	46	186
<i>In vivo</i> OM digestibility (%)	46	59
Nitrogen retention (g/day)	10,7	13,1
Feed CP intake (g/day)	86	111
OM fermented in rumen (g/day)	278	405
Bacterial CP to duodenum (g/day)	70	103
Total CP to duodenum	101	173
g Bacterial CP to duodenum/100 g OM fermented in rumen	25,3	25,4
Total CP to faeces	6	24

An important principle emerged from the results with regard to microbial protein production. The production of bacterial crude protein per 100 g of fermented OM was 25,3 g in the untreated group and 25,4 g with the treatment. The tempo of OM fermentation in the rumen was 46 % greater with the treatment. This suggests that microbial production for medium and good quality diets is only dependent on the mass of OM fermented in the rumen at *ad lib.* intake.

Another aim was to measure the partial digestion and retention of the 16 essential elements. Analyses of Zn, Mn, Cu, Co, N, Mg, Fe, Ca, P, K and Na were done. Of interest is the fact that the NaOH treatment resulted in negative balances of the elements K, Zn and Co. This suggests that extra K,

Zn and Co should be included in NaOH treated diets that are offered for a long time, otherwise production could suffer.

The last aim was to measure how accurately partial digestion is measured and how well markers allow faeces excretion to be measured. From the flow pattern of SiO_2 past the duodenum, ileum and in the faeces it was concluded that the technique is satisfactory.

Publication

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N-Ce.105/2:

EFFECT OF THE MOISTURE CONTENT OF KIKUYU HERBAGE ON ITS UTILISATION BY SHEEP. 1971-1974 S.F. Lesch, J.H. du Toit and T.K. Evenwell

Three groups each of eight Merino wethers approximately 10 months old and with an average mass of 26,7 kg were used in a trial to determine the effect of the moisture content of kikuyu herbage on the dry-matter intake and digestibility of organic matter and crude protein. Two digestion and intake trials were run, one during the first half and the other during the second half of the growing season. Kikuyu herbage at the same stage of growth as that fed fresh was dried in a forced-draught oven and used as hay. Animals were fed twice daily. The experimental rations were: Treatment 1: *Ad lib.* fresh cut kikuyu. Treatment 2: *Ad lib.* fresh cut kikuyu plus kikuyu hay at a mass ratio of 20 to 1. Treatment 3: Fresh cut kikuyu plus kikuyu hay at a mass ratio of 10 to 1.

The average dry matter content, average dry matter intake and average digestibility of organic matter and crude protein for the different treatment rations are presented in Table 1.

TABLE 1 - Average dry matter content, daily dry matter intake and digestibility of organic matter and crude protein for experimental treatments

Treatment No.	Period	Ration DM (%)	DM intake per 100 kg mass (kg)	DM intake per 100 kg mass ^{0.75} kg	Digestibility	
					OM	CP
1	1st	15,8	2,59	5,81	63,44	59,51
	2nd	13,2	2,85	6,51	64,10	68,40
	Ave.	14,5	2,72	6,11	63,77	63,95
2	1st	19,7	2,72	6,17	60,89	55,58
	2nd	26,3	2,94	6,80	62,29	62,79
	Ave.	18,0	2,84	6,48	61,59	59,83
3	1st	21,4	3,16	7,09	61,22	59,07
	2nd	21,0	3,30	7,50	66,59	62,94
	Ave.	21,2	3,23	7,29	63,90	61,00

Mass ^{0.75} is approximately equal to standard deviation.

Positive correlations between dry matter content of herbage and daily dry matter intake of animals were established. The following regression equations were obtained:

$$Y^1 = 2,06651 + 0,048811 \times (r = 0,37605^*)$$

$$Y^2 = 5,00061 + 0,09268 \times (r = 0,3246^*)$$

Y^1 = daily dry matter intake in kg per 100 kg live mass, Y^2 = daily dry matter intake in kg per 100 kg mass ^{0.75} and x = percentage dry matter in herbage

* $P < 0,05$

No significant differences in digestibility of organic matter or crude protein due to treatment were observed. The digestibility of organic matter and crude protein were slightly higher during the second trial, but there was no relationship between dry matter content of the herbage and the digestibility values obtained.

O-GI.125/23:

THE NUTRITIVE VALUE OF NATIVE PASTURE OF THE CENTRAL
ORANGE FREE STATE FOR SHEEP, WITH SPECIAL REFERENCE
TO THE INFLUENCE OF PROTEIN AND PHOSPHORUS
SUPPLEMENTATIONS. 1977-1980
H.O. de Waal and E.A.N. Engels

The practice of supplementary feeding to ruminants has developed as an integral part of the livestock industry in South Africa. The provision of N-containing supplements to grazing animals during winter is commonly advocated. Fairly good results have been obtained with beef cattle, but in the case of sheep the results have been inconsistent and very often disappointing. The South African native pastures, consisting mainly of grass, are generally regarded to be deficient in phosphorus (P) and should therefore be supplemented. Definite P deficiency symptoms have been demonstrated with cattle, as well as their positive reaction to P supplementation. In the case of free-grazing sheep no P deficiency symptoms have yet been found.

A two-phase study was conducted in order to investigate the influence of protein and P supplementation to sheep under free-grazing conditions as well as conventional digestibility trials. Two types of supplement were used, (i) a protein supplement (fish meal 50 %, salt 30 %, dicalciumphosphate 15 % and molasses meal 5 %) and (ii) a salt phosphate supplement (salt 50 %, dicalciumphosphate 45 % and molasses meal 5 %).

Grazing trial

The first part of the study was conducted on native pasture of the Central Orange Free State (Glen) at a stocking rate of 1 sheep/ha and under three-camp rotational grazing system.

Since the lack of response by sheep to supplemental feeding can in part be attributed to the varying and sporadic intake of a lick, it was decided to provide both types of supplement in two different ways. The sheep in Treatments 1 (Control) and 2 received either the salt phosphate or protein supplement via a lick. The sheep in Treatments 3 and 4 received 30,4 g and 61,3 g respectively of the two supplements via rumen cannulae directly in the rumen.

To accommodate the possibility of breed differences, Dorpers and Merinos were used as experimental animals. Body-mass changes, wool production of the Merinos, voluntary feed intake, rumen NH₃ concentration and diet selection were studied.

Conventional digestibility trials

The second phase of the study was conducted in digestibility crates and individual feeding pens.

Veld hay was cut on four occasions in the experimental camps. The first two cuttings (June and October 1977) were pooled in order to represent winter hay, with the last two cuttings (January and April 1978) representing summer hay. Digestibility and feed-intake studies were done on each kind of hay. Three sheep per breed and treatment were used for the digestibility trials while a further three per breed and treatment were fed in individual pens to obtain additional information on voluntary feed intake.

Grazing trial

The highest average daily intake of the salt phosphate lick by the sheep in Treatment 1 was recorded during August 1977 (14,6 g/day) and for the protein lick in Treatment 2 during July 1977 (28,2 g/day). The intake of both licks declined until May 1978 (4,9 g salt/phosphate vs 6,5 g protein lick per day). The sheep in Treatments 3 and 4 were supplemented at a constant daily level of 30,4 g and 61,3 g of the two supplements respectively.

Over the experimental period the Dorpers gained significantly ($P < 0,05$) more in body mass than the Merinos in Treatments 1 and 4, but not significantly more in Treatments 2 and 3. Within breeds only the Dorpers in Treatment 1 gained significantly ($P < 0,05$) more than those in Treatment 3. The final body mass of the Dorpers in Treatment 1, 2 and 4 was significantly ($P < 0,05$) higher than those for the Merinos in the corresponding treatments. Within breeds the Dorpers in Treatments 1 and 2 were significantly ($P < 0,05$) heavier than those in Treatment 3. In comparison the Merinos showed no significant ($P < 0,05$) differences, although Treatment 4 produced the lightest sheep.

The production of wool by the Merinos was divided into a winter (247 days) and summer (217 days) period. As regards the fibre produced, the results suggested that although the increase in fibre length

between the winter and summer periods was more than the increase in fibre diameter, fibre diameter contributed proportionally more to the increase in total wool production.

The differences in diet selection between breeds, as reflected in crude-protein content and digestibility of organic matter (OM), were not significant ($P < 0,05$).

The variation in crude-protein content and digestibility of OM of the native pasture followed a seasonal pattern.

Voluntary feed intake by the sheep was only in a few cases significantly ($P < 0,05$) influenced by supplementary feeding. Over the experimental period the Merinos consumed significantly ($P < 0,05$) more OM than the Dorpers (76,9 g vs 70,0 g per W^{0,75} kg).

The differences in digestible organic matter intake (DOMI) per W^{0,75} kg within breeds revealed no definite trend due to any of the treatments. Between breeds the Merinos consumed significantly ($P < 0,05$) more (9,9 %) DOM per day than the Dorpers (47,5 g vs 41,1 g per W^{0,75} kg).

While some of the differences regarding crude-protein intake between treatments within breeds were significant ($P < 0,05$), these differences showed no definite trend. The intake of crude protein by the sheep followed a definite seasonal trend.

The intake of crude protein by sheep from the pasture was more than the standards set by NRC (1975).

The intake of P via the licks in Treatments 1 and 2 made a small contribution towards the P requirement as set by ARC (1965) standards. In comparison, the supplements in Treatments 3 and 4 provided all the P required by the sheep.

With regard to the P content of blood plasma the differences between breeds and treatments were not significant ($P < 0,05$). The Ca and Mg content of plasma of the sheep in Treatment 1 (control) were highly significantly ($P < 0,01$) higher than those of the other treatments for both breeds.

Conventional digestibility trials

The Merinos in Treatment A daily consumed 126 and 244 % more of the salt/phosphate lick than the Dorpers on the winter and summer hay respectively. The high salt intake via the lick by the Merinos was reflected in a higher water consumption.

Supplementary feeding had no significant ($P < 0,05$) influence on the OMI of both breeds on either of the hays. A highly significant ($P < 0,01$) difference in voluntary intake by the sheep was found between the winter and summer hays. The sheep that were kept in the digestibility crates consumed significantly ($P < 0,05$) more (8,7 %) of the hays than those that were fed in individual pens.

Supplementation of the two hays did not influence digestibility of OM significantly ($P < 0,05$). The average digestibility of OM for the summer hay was significantly ($P < 0,01$) higher than the average for the winter hay (48,3 vs 39,6 %).

Supplementation of the two hays by protein increased the apparent digestibility of total N highly significantly ($P < 0,01$). The apparent digestibility of N in Treatments A and B was highly significantly ($P < 0,01$) less for the winter than the summer hay.

Only the sheep in Treatment C on summer hay were in a positive N balance. The differences in N balance between Treatment C and Treatments A and B were highly significant ($P < 0,01$) for both hays. The difference in N balance between the two hays *per se* was also highly significant ($P < 0,01$).

Supplementation of protein *per rumen* to the sheep in Treatment C resulted in a significantly ($P < 0,01$) higher rumen NH₃ concentration than to those in Treatment B. This only reflected the long-term effect of protein supplementation on the activity of microbes in the rumen. The sheep had a significantly ($P < 0,05$) lower rumen NH₃ concentration on the winter than the summer hay.

The poor response of the sheep to a protein supplement on veld hay was linked to an inherent restriction on the availability of energy.

Conclusions

The results of both phases of the study suggest that the existing practice of protein and P supplementation to free-grazing sheep in the central Orange Free State should be reconsidered.

The practice of extrapolation from pen fed conditions to the free-grazing ruminant without any reservations is, due to obvious differences between the two regimes, unacceptable.

In future studies more attention will be given to the reproducing animal. The possible role of energy, in combination with protein in overcoming the critical periods of nutrient availability to the ewe and her lamb on native pasture, will be investigated.

REPRODUCTION

C.D. Hamilton: HORMONAL INDUCTION OF OESTRUS IN LACTATING EWES.
M.Sc. (Agric.) : University of Natal. 1978
Supervisor: Prof. A.W. Lishman

The induction of oestrus was attempted in 172 early post partum lactating Merino ewes. Treatments employed were (i) a single 50 µg injection of GnRH (ii) two 50 µg injections of GnRH 16 days apart (iii) 600 IU PMSG-progesterone implant - 600 IU PMSG (iv) PMSG-implant-PMSG plus 50 µg oestrogen and (v) a control group. Treatment was initiated on day 15 post partum and terminated on day 31. Half the ewes were run with fertile rams, while the remaining ewes were associated with teaser rams to detect oestrus.

Although the most effective treatments to induce synchronized overt oestrus were those involving the administration of progesterone, this hormone was associated with reduced conception rates.

Overall, no significant differences in the mean lambing intervals were obtained, suggesting that the use of exogenous hormones was of little value during the autumn period.

In a second experiment during spring the effects of oestrogen priming and GnRH administration on the release of LH was investigated, using 66 SA Mutton Merino ewes in early lactation. Nine ewes served as controls, while the remaining ewes were divided into six groups and were subjected to combinations of oestrogen (divided and single doses) and split or single doses of GnRH. Blood samples were obtained every half hour for 12 hours and assayed for LH. Every second day thereafter and continuing for 20 days, blood samples were collected to measure progesterone secretion.

Significant differences in the release of LH in response to the various treatments were observed. Ewes receiving a divided oestrogen dose and a divided GnRH dose exhibited normal LH peaks with regard to the maximum peak levels, duration and the amount of LH released. The amount of LH released did not influence *corpus luteum* function. Mean maximum progesterone levels and the duration of progesterone secretion were considerably below normal.

Animal Products

MEAT PRODUCTS

W-Eb.101/1: PORK FLAVOUR STUDIES WITH PIGS CONSUMING DIFFERENT
QUANTITIES OF TREATED AND UNTREATED FISH MEAL.
1970-1972
G.N. van Wyk, J.M. van Hoope, W.A. Vosloo,
A. Atkinson and D. Basson

Sixty-four Landrace barrows, weaned at 56 days of age ($\pm$ 18 kg live mass), were used in nine treatment groups of six pigs each and one control group of ten pigs. The effect of different amounts of anti-oxidant-treated and untreated (oxidised) fish meal consumed by the pigs, and the resulting flavour of the meat, was studied. In treatments where fish meal was excluded, buttermilk powder was included to maintain the protein content of the diet at 18,6 % for the porker stage and 16,3 % (dry matter basis) for the finishing stage. In the control diet buttermilk powder was used as the main protein source on the assumption that it has no flavour-causing components. The effects of extracted fish oil and copper in the diet on meat flavour were also investigated. After 50, 70 or 90 days on the experimental diets, two pigs from each group were randomly selected and slaughtered to determine the effects of fish meal, fish oil and copper in the diet on the meat flavour. Tainting of the meat was determined by means of gas chromatographic assays and taste tests (a panel of 5 persons tasted at a time).

It was found that taint-free meat could be produced by feeding 12,6 % ethoxyquin-treated fish meal during the porker stage (50 to 70 days post-weaning) followed by a diet free of fish meal during the finishing stage. Tainting tended to be more pronounced as the feeding period of fish meal was increased. The inclusion of 250 mg/kg copper in the diet did not change the degree of tainting.

Curing of the meat reduced tainting slightly, but this could be attributed to the cooking process or to the effect of rancidity which developed in the fat portion of cured meat after prolonged storage. Smoking of the cured bacon did not have a clear masking effect on off-flavours.

No clear differences could be found in gas chromatographic tests on meat from pigs fed a high ethoxyquin-treated fish meal diet and meat from pigs fed no fish meal at all. Conclusions therefore are based on the organoleptic tests which have an element of subjectiveness.

Supporting Research

GENETICS

(A)VS-Pr.35/5:

ELECTROPHORETIC AND OTHER CHEMICAL-PHYSICAL STUDIES ON FARM ANIMALS, LABORATORY ANIMALS AND RELATED SPECIES (GENETIC POLYMORPHISM) : BIOCHEMICAL GENETIC STUDIES ON A NEW HAEMOGLOBIN TYPE OF CATTLE.

1976-1979

E.H.H. Meyer, G.M. Schwellnus, G. Guerin and
M.R. Schwellnus

Haemoglobin polymorphism in Brahman cattle and seven Southern African cattle breeds was investigated by means of starch gel electrophoresis. A difference was found between the migration rates of the Hb C of Brahman cattle and that of the indigenous Southern African cattle breeds, showing that these are actually two separate variants. We suggest that the faster migrating type, which occurs in Brahman cattle, should be called Hb C, while the slower migrating type of the Southern African breeds should be called Hb I.

A comparison of the migration of the α and β chains of all the variants encountered, including foetal haemoglobin, was carried out by means of starch gel electrophoresis in urea at acid and alkaline pH levels. Evidence was found of a difference in mobility of the non- α chains of haemoglobin A, B, C, I and F at different pH levels while no difference was detected in the migration rate of their respective α chains. These results confirm the theory that genetic variation is restricted to the non- α chain of bovine haemoglobin.

Progeny studies on 225 families confirm that the Hb I variant is allelic to Hb A and Hb B variants. The gene frequencies have been calculated on the basis that Hb I and Hb C are allelic at the β locus. The distribution of the different phenotypes is in accordance with this theory, assuming that the populations obey the Hardy-Weinberg equilibrium.

(A)VS-Pr.104/1:

THE USE OF LABORATORY ANIMALS AS BIOLOGICAL MODELS IN ANIMAL BREEDING PROBLEMS : THE QUANTIFYING OF GROWTH AND EFFICIENCY OF FEED UTILIZATION FOR SELECTION PURPOSES IN *RATTUS DOMESTICUS*.

1977-1979

M.M. Scholtz

The Roux model ($\ln y = \ln a + b \ln x$), which had been used with great success in nutrition studies, was used for the quantifying of growth and efficiency of feed utilization for selection purposes in *Rattus domesticus*. It was found that the post-weaning growth of the rat can be divided into three phases plus a transition period. These phases are related to the physiology of the rat. Each phase is described by a straight line in terms of slope (b) and intercept (a).

Significant differences for both slope and intercept were found between families in the first two phases, and consequently also significant heritabilities. The differences between families in the third phase were non-significant. The significant heritabilities (h^2) indicate the possibilities of selection progress if selection should be practised for any one of these statistics (slope and intercept). This expectation of selection progress is based on the magnitude of the heritability estimates as indicated in Table 1.

TABLE 1 - Heritability estimates

Statistic	h^2	Interval
a_1	0,47	0,33-1,41
b_1	0,32	0,18-1,21
a_2	0,43	0,30-1,37
b_2	0,38	0,25-1,31

Extremely high negative correlations ($> -0,96$) were found within phases between slope and intercept. This leads to practical problems, since both slope and intercept may be involved with efficiency. Intercept is important for efficiency at an early age, and slope is important for efficiency in the long term. Between these periods efficiency should be based on an optimal combination of slope and intercept. It

appears therefore that selection for efficiency in practice should be based on the choice of an optimal combination of slope and intercept. It is speculated that this high negative correlation possibly has a geometric as well as genetic cause.

The phenotypic correlation of the same statistic between phases is low ($<0,2$). It is therefore important to consider the different growth phases in any evaluation programme, since the performance of an animal (rat) in one phase is a poor indication of its performance in another phase. The rank correlation of animals between phases is non-significant. This confirms the allegation that an animal with a good performance in slope or intercept in one phase, does not necessarily also have a good performance in another phase. It is, however, interesting that the genetic correlation of the same statistic between phases is relatively high ($>0,65$).

It seems that the Roux model succeeds in quantifying growth and efficiency of feed utilization for selection purposes in the active growth phases. There are, however, numerous questions, such as the high negative correlation between slope and intercept of the same phase, that need to be clarified before any definite conclusions can be drawn. A selection experiment was designed to investigate some of these questions.

ANIMAL HEALTH

Veterinary Science

CATTLE

BACTERIA

- OP-HYG.18: OBSERVATIONS ON THE EFFECT OF DIFFERENT METHODS OF PROCESSING ON THE BACTERIAL CONTAMINANTS OF BOVINE AND OVINE TRIPE. 1978
H.N. van der Made and J.J. van Staden

A comparison was made of the multiplication of bacteria in specimens of tripe processed in different ways. There was little difference in this respect between commercial tripe as offered for purchase to the consumer and rough and scraped tripe incubated at 30 °C for 24 h. Tripe stored at 4 °C or in acetic acid (pH 4) at 30 °C for 24 h, however, had appreciably fewer bacteria.

ANAPLASMOSIS

- OP-PROT.15: THE LONGEVITY, PATHOGENICITY AND IMMUNOGENICITY OF ONDERSTEPSPOORT ANAPLASMOSIS (*A. CENTRALE*) VACCINE. 1979
R.D. Bigalke and S.E. Ellis

The infectivity, pathogenicity and immunogenicity of the Onderstepoort anaplasmosis vaccine were tested under laboratory conditions in Hereford cattle at an average age of 7 years. The *Anaplasma centrale* vaccine was found to be 100 % infective. It was, however, considerably more pathogenic in these adult animals than had been anticipated. The average minimum packed cell volume (PCV) was 12 % at the height of the reaction and one animal died from typical anaplasmosis when the PCV reached 9 %. Parasitaemia reached relatively high levels - the average maximum being 24,2 %.

When the 12 surviving cattle were challenged with *Anaplasma marginale* 3 months after immunization, most animals developed only a low level parasitaemia (average maximum 2,9 %), but one animal reacted as severely as the non-immunized controls. From these results it can be deduced that 92 % of the animals were protected by immunization whereas 8 % were fully susceptible despite adequate sensitization with *A. centrale*.

It is clear that the *A. centrale* vaccine cannot be used with safety in adult animals. There is, however, no reason to doubt the safety of the vaccine in calves up to weaning age, the recommended age at which to immunize against anaplasmosis.

REPRODUCTION

- OP-REP.9 & 12: INFECTIOUS CAUSES OF PERINATAL MORTALITIES IN RUMINANTS. 1978
A.P. Schutte and J.A.W. Coetzer

The advantages and disadvantages of the different diagnostic techniques, e.g. pathological and microbiological studies, immunoglobulin and specific antibody determinations in relation to these mortalities are discussed. The most important pathological lesions in the placentas and fetuses are described.

VIRUSES

- OP-PATH.40: WESSELSBRON DISEASE : A CAUSE OF CONGENITAL PORENCEPHALY AND CEREBELLAR HYPOPLASIA IN CALVES. 1979
J.A.W. Coetzer, A. Theodoridis, S. Herr and L. Kritzing

Fifteen pregnant cows were inoculated subcutaneously and intravenously between 101-147 days of gestation with the wild-type Wesselsbron disease virus. In addition, 2 fetuses were injected directly through the uterine wall after surgical exposure of the pregnant horn. The clinical symptoms, viraemia and serology in the cows are reported, as also the gross- and histopathology and the virological and serological results of the calves and fetuses.

Abortion was not an important manifestation of experimental Wesselsbron disease in cows, as it occurred in 3 animals only. Apart from a short temperature reaction in some cows no other clinical symptoms were recorded.

A viraemia was not always present in these cows and, when detected, was of low magnitude and short duration.

One cow, in which the foetus was inoculated at 115 days of gestation, aborted at 231 days. The foetus showed marked porencephaly and cerebellar hypoplasia.

FOWLS

BACTERIA

- OP-POUL.17: A COMPARATIVE STUDY OF SELECTED AVIAN MYCOPLASMA STRAINS. 1979
J.H. du Preez

On the basis of biochemical characterization and serological typing the various strains were grouped into 10 distinct and different avian mycoplasma serotypes or species namely *M. gallisepticum* (serotype A), *M. gallinarum* (serotype B), *M. iners* (serotype E-G), *M. melaeigrdis* (serotype H), *M. synoviae* (serotype S) and unnamed serotypes C-O-P, D, F, L and a heterologous group I-J-K-N-Q-R. The 11th serotype identified was an *Acholeplasma* of unknown origin.

The biochemical characteristics of the different serotypes were recorded and methods to this end were established.

SHEEP

FUNGI

- OP-TOX.23: GAMMA-GLUTAMYL TRANSPEPTIDASE ACTIVITY IN SHEEP SERUM : NORMAL VALUES AND AN EVALUATION OF ITS POTENTIAL FOR DETECTING LIVER INVOLVEMENT IN EXPERIMENTAL LUPINOSIS. 1977
W.D. Malherbe, T.S. Kellerman, N.P.J. Kriek and W.H. Haupt

A brief survey of the literature on gamma-glutamyl transpeptidase (-GT) activity is included in this study. The levels of activity in the serum of normal Merino sheep (13,6-32,4 ml.U./ml) were ascertained as a preliminary to following the activity through the entire course of experimentally induced ovine lupinosis, a hepatotoxicosis caused by *Phomopsis leptostromiformis* (Kühn) Bubák. The response of the serum level of -GT activity to the course of the disease was compared with that of glutamate oxaloacetic transaminase (GOT) and 2 liver function tests for the purpose of assessing its potential application in the study of this mycotoxicosis. Because the levels of activity of -GT were more valuable for the early diagnosis of low grade acute intoxication and the detection of chronic liver involvement while those of GOT gave better information on the development of severe acute hepato-cellular damage, these 2 enzymes, considered together, were found to give the best information on the course of the toxicosis. The changes in -GT activity during various stages of intoxication were also related to the histopathological lesions in the liver.

VIRUSES

- OP-MOL.41: DEMONSTRATION OF JS-3 HERPESVIRUS DNA IN JAAGSIEKTE TUMOR CELLS. 1980
Ethel-Michele de Villiers and D.W. Verwoerd

To investigate further the possible involvement of *Herpesvirus ovis* in the aetiology of jaagsiekte, the kinetics of reassociation of viral DNA and DNA isolated from tumour tissue as well as from cell cultures derived from it, were studied. Although DNA-DNA hybridization could be demonstrated in two cases of jaagsiekte, no correlation was found between the presence of *Herpesvirus ovis* genome sequences and the occurrence of the disease.

- OP-PATH.33: *HYDROPS AMNII* IN SHEEP ASSOCIATED WITH HYDRANENCEPHALY AND ARTHROGRYPOSIS WITH WESSELSBRON DISEASE AND RIFT VALLEY FEVER VIRUSES AS AETIOLOGICAL AGENTS. 1977
J.A.W. Coetzer and B.J.H. Barnard

During the 1974/75 lambing season numerous reports were received from various parts of South Africa and South West Africa of severe abdominal distension in ewes after vaccination with the attenuated Rift Valley fever and/or attenuated Wesselsbron disease vaccine. The ewes were vaccinated at different stages of gestation in spite of recommendations to the contrary, the syndrome being especially obvious in ewes immunized with one or both of these vaccines during the first trimester of pregnancy. In some of the flocks *hydrops amnii* was recorded in as many as 15% of the ewes. Many of the ewes so affected showed a prolonged gestation of up to 6-7 months and, towards the end of gestation, were unable to rise or walk. They eventually died of ketosis, hypostatic pneumonia and complications due to dystocia.

The foetuses examined were malformed and larger than normal with a mass of 3,6-6,7 kg. They usually showed arthrogryposis, brachygnathia inferior, hydranencephaly, hypoplasia or segmental aplasia of the spinal cord and neurogenic muscular atrophy.

The amnion contained 8,0-18,0 l of amniotic fluid, the endometrium was oedematous, and cystic tube-like dilatations, 1-10 mm in diameter, filled with a clear fluid, were scattered in the endometrium.

No definite conclusions as to the aetiology of the syndrome could be drawn from serological tests performed on the ewes, lambs or foetuses.

Preliminary experimental work confirmed previous observations that the attenuated Wesselsbron disease vaccine virus is responsible for this syndrome and that the wild-type is also implicated. In addition, the attenuated Rift Valley fever vaccine virus was found to be responsible for arthrogryposis and hydranencephaly without *hydrops amnii* and for micrencephaly and arthrogryposis associated with *hydrops amnii* in the ewe.

- OP-PATH.36: WESSELSBRON DISEASE: PATHOLOGICAL, HAEMATOLOGICAL
AND CLINICAL STUDIES IN NATURAL CASES AND
EXPERIMENTALLY INFECTED NEW-BORN LAMBS. 1978
J.A.W. Coetzer, A. Theodoridis and
Anneline van Heerden

This is a report on the clinical signs of Wesselsbron disease in 37 lambs and the pathology of 4 natural and 12 experimental cases. Generally the symptoms were ill-defined. At autopsy 13 of the 14 lambs revealed a mild to severe icterus and a slight to moderate hepatomegaly with discoloration of the liver. No foci of hepatic necrosis were observed macroscopically and, except for petechial and ecchymotic haemorrhages in the mucosa of the abomasum and generalized lymphadenopathy, no other obvious macroscopic lesions were noted. Perforation of the abomasum occurred in one lamb only.

Microscopy on the liver showed mild to extensive necrosis of the parenchyma. Degenerated and necrotic hepatocytes were diffusely scattered throughout the liver, but no definite well-circumscribed foci of necrosis were seen.

Mitotic figures and hepatocytes with large nuclei indicated that active regeneration of parenchymal cells had occurred in some of the livers. Other changes, for example, Kupffer cell proliferation, sinusoidal leucostasis, bile duct proliferation and infiltration of mononuclear cells in the portal triads, were frequently encountered. Moderate to severe cholestasis was a feature in 66% of the livers examined, while intranuclear inclusions and intracytoplasmic acidophilic or Councilman-like bodies were frequently observed.

A complete haematological study was carried out on 4 experimentally produced cases.

The gross and histopathological lesions in the liver are compared with those of Rift Valley fever in the new-born lamb.

- OP-VIR.46: APPLICATION OF THE FLUORESCENT ANTIBODY TECHNIQUE FOR
THE DIAGNOSIS OF WESSELSBRON AND RIFT VALLEY FEVER
VIRUSES. 1979
A. Theodoridis

The necessary reagents for direct and indirect fluorescent antibody (FA) staining of Rift Valley fever and Wesselsbron viruses in tissues have been produced and tested. The results obtained indicate that these FA tests are reliable for an early diagnosis of Rift Valley fever and Wesselsbron disease from fresh field specimens such as organ tissues and serum.

GENERAL

BACTERIA

- OP-DMR.43: METABOLIC PATHWAYS IN *BUTYRIVIBRIO FIBRISOLVENS*. 1979
N.O. van Gylswyk

Phosphoenolpyruvate carboxykinase (adenosine 5'-triphosphate) was the only enzyme capable of carboxylating pyruvate or phosphoenolpyruvate that could be demonstrated in sonicated cells or cell-free extracts of a group 1 butyrvibrio.

INTERNAL PARASITES

- OP-HELM.25: COMPARISON OF SHEEP AND GOATS AS INTERMEDIATE HOSTS
OF *TAENIA OVIS*. 1979
A. Verster and R.C. Tustin

Although sheep appear to be more susceptible to infestation in that more cysticerci develop in them, relatively few of the parasites are viable. Thus 5 of the 15 sheep had more than 100 cysticerci but in 4 of

them from 80-100 % of the cysticerci were degenerate. Only one goat had more than 100 cysticerci and of them 2,7 % were degenerate. In the sheep 50 % or more of the cysticerci were degenerate in 10 animals. In the goats on the other hand, the greatest number of degenerate cysticerci encountered was 36,8 %, in the remaining goats 20 % or less were degenerate. Goats therefore appear to be more suitable intermediate hosts than sheep.

TICKS

- OP-ENT.31: STUDIES ON THE PHEROMONES OF ADULT *AMBLYOMMA*
 HEBRAEUM. 1979
 J.H. Brill

A bioassay was developed which enabled the detection of the pheromones of the bont tick (*Amblyomma hebraeum* Koch) within 2 hours with a reproducibility of 82 ± 13 %. Dried, solventextracted ticks were glued to the shaved backs of rabbits. Those ticks to which pheromone extract was subsequently applied, strongly attracted females of the same species.

In a two-way choice test a cork disc impregnated with pheromone extract was even more attractive to female ticks than a treated dried tick.

VIRUSES

- OP-VIR.25: COMPARATIVE IMMUNIZING POTENCY OF VARIOUS VACCINES
 AGAINST RIFT VALLEY FEVER VIRUS. 1979
 B.J.H. Barnard

Attenuated Rift Valley fever viral vaccine can be used successfully in goats, sheep and cattle. The development of antibodies after administration of the attenuated vaccine is weak, especially in cattle, and is often not detectable. Even so, such treated animals are immune.

Inactivated vaccine can be used successfully in all three species and is particularly valuable in the case of an outbreak of the disease when pregnant animals have to be inoculated.

The plague-inhibition test is more sensitive than either the serum-virus-neutralization test in mice or the haemagglutination test. It is easy to apply and not so expensive as the other two tests.

PASTURE UTILISATION

Natural Pastures

VELD

EVALUATION

N-Ce.132/2(K):

EVALUATION OF *CYNODON DACTYLON* CV. COASTCROSS 2 IN THE EASTERN GRASSVELD: THE PERFORMANCE OF A BEEF-COW HERD WHEN GRAZED CONTINUOUSLY ON COASTCROSS 2 PASTURES AT UMLAAS ROAD. 1974-1976
J.K. Arnott

The trial conducted at Umlaas Road, has shown that *Cynodon dactylon* cv. Coastcross 2 grown under a mean annual rainfall of 650 mm, responds well to irrigation at an optimum application rate of 400 mm/annum in 16 cycles on clay/loam soil. Coastcross 2 also grows well under dryland conditions and when compared with kikuyu under similar conditions, the former gives better results in terms of animal production.

A yield of between 15 and 18 t DM/ha/annum can be expected from this pasture when irrigated as above and topdressed with 350 kg N/ha/annum. The equivalent in terms of animal product means a stocking rate of 7 mlu*/ha for 283 days. Dryland Coastcross 2 pasture at Umlaas Road would yield about 10 t DM/ha/annum when topdressed with 200 kg N/ha. The grazing duration on irrigated Coastcross 2 would be from about 20 September until 30 June when stocked at 7 mlu/ha in a closed rotation system.

The quality of this pasture tends to be highest during the spring period when a 70% TDN was obtained. The quality dropped during early autumn to 62% TDN and then in late autumn rose to 67% TDN.

The type of stock used were *B. indicus* females crossed with British beef breed and dual-purpose males. An 80% calving rate was obtained and the ADG for calves was at least 0,8 kg for the grazing period.

If the treatments as previously described are applied, then at least 2 000 grazing days/mlu/ha/annum can be expected. The calves on this trial were weaned on average at 6 months and a mean weaning mass of 190 kg. To sell the weaners at this age was not economical and so they continued on the pasture until the end of June and then were wintered on a cheap ration to gain 0,2 kg/day. They returned to the pasture from mid-September until about mid-November at an ADG of 0,8 kg and were then placed in a feedlot to finish for marketing during the following January and February. The feedlot ADG was 1,25 kg.

Publication

Theron, E.P. & Arnott, J.K., 1977. Notes on the performance of Coastcross 2 Bermuda grass in Natal. *Proc. Grassld Soc. sth. Afr.* 12, 87-89.

* mlu = 450 kg mature livestock unit

O-Kf.17/1:

THE VALUE OF *TARCHONANTHUS* SHRUBS IN THE DIET OF SHEEP. 1964-1980
W.R.E. Nursey

This study indicated that the effect of the removal of *Tarchonanthus camphoratus* from the experimental paddocks on the production of weaner Dorper lambs was not significant.

It was also subsequently estimated that the composition of the veld among the different treatments was not homogeneous at the time when this experiment commenced. Therefore any conclusions regarding the effect of these treatments are questionable.

GRAZING

T-Mr.9/2:

INFLUENCE OF GRAZING CATTLE AND GOATS ON MOPANE VELD.
1969-1977

C.H. Donaldson and F. Badenhorst

Experiments conducted in Southern Africa have clearly shown that the goat is primarily a browser and that it can play a definite role in the utilisation and improvement of the bushveld. Although meat-producing goats can be successfully used to control shrub, there is little published information available to show that goats or goat/cattle units can yield higher returns of meat than cattle units.

The experiment was started in April 1969 on the Messina Research Station (29° 54' E and 22° 10' S) in the Mopane veld (Acocks, 1953, veld type 15). The 41 years' long-term annual rainfall at the Research Station is 340,8 mm and the temperature varies from a mean maximum of 33,1° and mean minimum of 18,9°C in December to a mean maximum and mean minimum of 24,1° and 6,4°C in July respectively. Frosts are rare.

Three treatments were applied, viz. steers alone(S), goats alone(G) and goats with steers(GS). Five equal-sized (25,7/ha) camps were randomly allocated to each treatment. The camps of the S treatment were grazed with ten steers. Those of the GS treatment were initially grazed with five steers and 35 boer goat wethers. The G treatment was initially stocked with 70 wethers. The goat numbers of the G and GS treatments were subsequently reduced to 60 and 30 respectively. The five camps of each treatment were grazed according to a fixed rotational grazing system, allowing one week grazing and four weeks rest throughout the experimental period.

The treatments were terminated during August 1975 at which stage the bush in the goat treatments was well utilised up to the browse line (2 m above ground level). The effects of the three treatments were measured by applying a follow-up treatment for a period of two seasons. The camps of the previous treatments were stocked with 5 steers and 29 goats each.

The botanical composition of the grass sward was determined at the start of the experiment and again five years later. Sample techniques were used on all camps during April 1973 to determine the respective relative amounts of grass (by measuring the height of grass growth) and percentage browse of the four most important woody plant species (by subjectively estimating the amount of leaves browsed up to the 2 m browse-line).

The data in Table 1 show that:

The differences in the species composition and basal cover percentages between treatments were relatively small.

In each treatment the annual and perennial grasses and the total basal cover increased significantly over the four-year period. Although not significant, more perennial grass species were recorded in the G treatment than in the camps of the GS and S treatments.

TABLE 1 - Mean percentage cover of camps of steers alone, goats alone and steers with goats treatments in 1969 and 1974 surveys

Grass species	Steers alone		Goats alone		Steers with goats	
	1969	1974	1969	1974	1969	1974
Annual grass						
<i>Aristida adscensionis</i>	0,93	2,17*	0,77	2,80*	0,79	2,87*
<i>Brachiaria deflexa</i>	-	0,01	-	0,01	-	0,03
<i>Enneapogon cenchroides</i>	0,05	0,15	0,07	0,17	0,08	0,22
<i>Tragus racemosus</i>	-	0,43*	0,02	0,21*	0,04	0,29*
Total	0,98	2,76*	0,86	3,19*	0,91	3,41
Perennials						
<i>Brachiaria nigropedata</i>	-	-	-	0,01	-	-
<i>Bothriochloa radicans</i>	0,01	0,01	-	0,01	-	0,01
<i>Cenchrus ciliaris</i>	-	-	-	0,01	-	-
<i>Digitaria eriantha</i>	-	-	-	0,01	-	-
<i>Eragrostis lehmanniana</i>	0,03	0,10	0,05	0,16	0,03	0,07
<i>Eragrostis rigidior</i>	-	-	-	0,01	-	-
<i>Eragrostis superba</i>	-	-	-	0,01	-	-
<i>Droptetum capense</i>	0,01	0,21*	0,03	0,21*	0,03	0,16*
<i>Panicum maximum</i>	-	0,01	-	0,01	-	0,01
<i>Rynchelytrum nyassanum</i>	-	0,01	-	-	0,01	-
<i>Schmidtia pappophoroides</i>	0,01	-	0,01	0,03	-	-
<i>Stipagrostis uniplumis</i>	-	0,03	0,01	0,02	0,01	0,04
<i>Urochloa mosambicensis</i>	-	0,02	-	0,02	-	0,02
Total	0,06	0,39*	0,10	0,51*	0,08	0,31*
Total (all species)	1,04	3,15*	0,96	3,70*	0,99	3,72*

The annual species constituted more than 80 % of the total basal cover, illustrating the pioneer state of the veld.

From regular field observations it was evident that there was always more grass in the G and GS treatments than in the S treatment.

TABLE 2 - Mean grass production expressed in total grass height (cm) per camp for each treatment (18/5/73)

	Goats & steers		Steers		Goats	
	Height (cm)	Relative height (%)	Height (cm)	Relative height (%)	Height (cm)	Relative height (%)
<i>Aristida adscensionis</i> (dead)	184	63,4	152	89,4	190	47,5
<i>A. adscensionis</i> (alive)	64	22,1	16	9,4	142	35,5
Total (<i>Aristida</i>)	248	85,5	168	98,8	332	83,0
<i>Eragrostis lehmanniana</i> (dead)	3	1,0	-	-	9	2,2
<i>E. lehmanniana</i> (alive)	17	5,8	-	-	49	12,2
Total (<i>Eragrostis</i>)	20	6,8	-	-	58	14,4
<i>Stipagrostis uniplumis</i>	22	7,6	1	0,6	10	2,5
<i>Enneapogon scoparius</i>	-	-	-	-	1	-
<i>Aristida meriodionalis</i>	-	-	-	-	-	-
<i>Cenchrus ciliaris</i>	-	-	1	0,6	-	-
Total (all species)	290	99,9	170	100,0	401	99,9

The mean grass height in the camps of the G treatment was approximately 183 and 54 % more than the grass in the camps of the S and GS treatments respectively. These figures confirm the generally accepted conclusion that in bushveld areas steers utilize grass to a greater extent than goats. An interesting feature of the data in Table 2 is that relatively more green grass was recorded in the goat treatments than in the steer treatment, this probably being attributable to more soil moisture having been available in the goat camps.

From field observations it was already evident during the second season that goats showed a greater preference for browse than steers.

The goats utilised 74,5 % of the browse of the woody plants while 33,3 % and 63,0 % of the browse was respectively utilised by the steers and goats in conjunction with steers. The data reveal that goats browse more than cattle and furthermore that the foliage of woody plants may also contribute substantially to the food intake of cattle. This confirms the general opinion held by ranchers in the Mopane veld that trees and shrubs do provide additional food for cattle.

The livestock data for the treatments are presented in two parts, viz. the mean annual live mass gain per animal (Table 4) and the annual live mass production per ha (Table 5).

TABLE 3 - Mean percentage utilisation of 4 dominant woody plant species within browse-line (18 March 1973)

Woody plant	Goats and steers	Steers	Goats
<i>Combretum apiculatum</i>	76	33	80
<i>Terminalia prunioidis</i>	62	36	78
<i>Colophospermum mopane</i>	62	28	72
<i>Grewia</i> spp	52	36	68
Mean	63,0	33,3	74,5

TABLE 4 - Annual live mass production in kg/animal for three treatments

Year	Rainfall (mm)	Goats with steers		Steers alone	Goats alone	Equivalence*
		Goats	Steers			
1969/70	320	20,3	88,7	78,3	20,9	4,1
1970/71	410	17,7	86,3	93,9	13,3	5,8
1971/72	548	13,1	157,4	138,1	14,0	10,9
1972/73	211	16,7	100,6	84,9	10,3	6,9
1973/74	493	10,6	156,0	157,4	7,8	17,0
1974/75	457	9,1	192,9	171,5	9,4	19,7
Mean	406	14,6	130,3	120,7	12,6	10,7

* Number of goats to equal live mass production of one steer.

The most noteworthy features of these data are the following:

- The mean annual live mass gain per goat tended to decrease progressively in time while the average live mass gain of the steers increased markedly over the 6-year period. For the first season (1969/70) the goats in the GS and G treatments gained 20,3 and 20,9 kg, while the annual live mass gains for the 1974/75 season were only 9,1 and 9,4 kg per goat respectively. The decline in performance of the goats over the years can be ascribed to the decrease in available browse. It would therefore appear that after the first season the subsequent leaf production of the woody plants (up to the browse-line) was low, despite the fact that the rainfall for most years was well above average.
- The goats in the GS treatment gained on the average 2,0 kg live mass/goat/annum more than the goats in the G treatment, while the steers in the GS treatment gained 9,6 kg live mass more than the steers in the S treatment.
- During the first season (when browse was abundant) the live mass gained by 4,1 goats was equivalent to the mass produced by one steer. This ratio widened progressively to 19,7 goats to one steer in the last season (when browse was scarce), with a seasonal average of 10,7 goats to one steer. These data may therefore suggest that goats are relatively inefficient producers of meat. It is apparent from the 1969/70 season's data (when browse was plentiful) that the goat is probably an efficient converter of browse to meat, provided that the goats can obtain sufficient browse.

TABLE 5 - Annual live mass (kg/ha) for three treatments

Year	Goats	Goats with Steers Steers	Total	Steers alone	Goats alone
1969/70	5,32	3,45	8,77	6,09	11,20
1970/71	4,73	3,43	8,16	7,65	7,25
1971/72	3,52	6,15	9,65	10,75	7,55
1972/73	3,75	3,91	7,66	6,60	4,33
1973/74	2,35	6,07	8,42	12,25	3,65
1974/75	1,81	7,51	9,32	13,35	3,45
Mean	3,58	5,08	8,50	9,45	6,24

Table 5 shows that during 1969/70 the goats' contribution to the total live mass production per ha of the GS treatment was 61 %. During the same year the goats of the G treatment produced 84 % more live mass/ha than the steers of the S treatment. During 1974/75 the steers' contribution to the total production of 9,32 kg/ha in the GS treatment was 81 %, while the steers of the S treatment produced 187 % more live mass/ha than the goats of the G treatment. Over the 6-year period the steers of the S treatments outproduced the goats of the GS and G treatments by 42 % and 51 % respectively.

The steers of the camps previously stocked with goats only for a 6-year period gained on the average 26,5 kg more per steer than the steers in camps previously stocked with steers only (Table 6). The relative mass gains of the goats and steers of the goat with steers treatment were intermediate to those of the goats and steers of the steer-only and goat-only treatments. The goats of the treatment previously stocked with steers only gained on the average 7,3 kg more than the goats in the treatment previously stocked with goats only. The mass gains of the goats from the goats-and-steers treatment were intermediate to the relative mass gains of the animals in the steer-only and goat-only treatments. The steers' contribution to the total production per ha of the steers alone, goats alone and goats-with-steers treatment was 64; 92,8 and 81,9 % respectively.

TABLE 6 - Mean annual live mass gain and production per ha of steers and goats for the two-year post-experimental evaluation period

Mass gain per animal and per ha	Season	Treatment applied (1969/1975)		
		Steers alone	Goats alone	Goats with steers
Mean annual mass gain/goat (kg)	1975/77	8,9	1,6	3,9
Mean annual mass gain/steer (kg)	1975/77	92,5	119,0	101,0
Mean production/ha (goats & steers)	1975/77	5,61	4,99	4,81

The botanical and animal production data presented in this paper provide conclusive evidence of the importance of the browse of woody plants for the goat, and of the fact that cattle feed mainly on the herbaceous layer.

Conclusions

The goat can play an important role in the utilisation of the browse of Mopane veld and in encouraging grass production. It was, however, noticeable with the stocking rates adopted, that once the browse had been well utilised, the re-growth of the woody plants within the browse-line was slow and inadequate to meet the nutritional requirements of the goats for an optimum growth rate. Consequently in order to farm successfully with goats in Mopane veld, relatively low stocking rates should be used. With low stocking rates it can be expected that goats will provide an additional source of income by utilising a product which is normally not fully utilised by cattle. From experience gained at the Messina Research Station, it would appear that these aims can be met with the use of a ratio of one cow to approximately two breeding goats.

Although it is highly unlikely that goat farming (for meat production) can become the primary source of income in Mopane veld, the use of both cattle and goats appears to be desirable in order to utilise and control woody plants and to improve the veld condition. Farming successfully with goats will, however, depend largely on the control of vermin and tick-borne diseases and the judicious use of sound animal and veld management practices, with emphasis on the application of optimum stocking rates and correct ratios of cattle to goats.

MANAGEMENT

N-Ko.5/4:

PRODUCTION SYSTEMS FOR BEEF CATTLE AND SHEEP IN EAST
GRIQUALAND: GROWTH OF YOUNG CATTLE AND SHEEP
MANAGED ON A PREFERENCE AND FOLLOWER HERD BASIS
WITHIN A ROTATIONAL GRAZING SYSTEM ON SUMMER VELD.
1972-1973

A.D. Lyle, R.M. Bredon and G.M. Brockett

In order to obtain good animal growth on the veld, the less restriction that is placed on the animal regarding the selection of its diet, the better. On the other hand good veld grazing management demands that selective grazing must be reduced to the minimum.

In this trial cattle were grazed according to a preference and follower herd system. The object was to allow increased selection opportunity to the cattle in the preference herd while the follower herd grazed the camps off according to good veld management practice. By using weaner cattle the trial could be run over two years. In the first year the cattle in the preference herd were 26 kg heavier than those in the follower herd, and in the second year the mass advantage was 22 kg in favour of the preference herd. In both years the differences were statistically significant at the 1 % level. The sheep in the trial were withdrawn in the second year because of the danger of theft.

The percentage crude protein (CP) on offer was measured by sampling with oesophageal fistulated cattle and sheep. Samples were also obtained by clipping the veld.

The cattle in the preference herd selected samples with an average of 8,06 % CP compared to 7,01 % CP selected by the animals in the follower herd. In the case of the sheep the preference animals selected 10,52 % CP compared to the 8,99 % CP of the follower flock. The difference in % CP selected by the preference and follower cattle and sheep was significant at the 1 % level.

The conclusion is that by using a preference and follower grazing herd system, the animals in the preference herd benefit significantly by being able to select while the principles of good veld management are not compromised.

PRODUCTION

O-Gl.141/2:

PRODUCTION POTENTIAL OF NATURAL VELD IN THE ORANGE
FREE STATE, 1973-78
P.C.N. Goosen

An investigation was undertaken over a five year period, from 1973 to 1978, at two sites in the Orange Free State Region, to determine the productivity of the natural vegetation, with a view to establishing norms for carrying capacity of the veld. The experimental sites were in the Egmont Dam

catchment area, where the vegetation is representative of the veld types of the south-eastern Free State, and on *Cymbopogon-Themedra* veld, which is characteristic of the central Free State, on the Glen Agricultural Research Institute.

Prior to this investigation an intensive ecological survey, using the ordination technique, was undertaken at the Egmont Dam catchment site. The vegetation was classified into various communities on the basis of the occurrence and relative importance of various grass species (Bosch, 1975). Twelve of these communities, which were associated with specific soil conditions, were sampled for the present study.

These communities were identified as:

1. *Andropogon appendiculatus-Eragrostis plana* (Aa-Epl)
2. *E. plana-E.chloromelas* (Epl-Ec)
3. *E. chloromelas-E. plana - Themeda triandra* (Ec-Epl-Tt)
4. *T. triandra-E. chloromelas - E. plana* (Tt-Ec-Epl), all of which were associated with heavy clay soils, for example more than 20 % clay in the A-horizon
5. *E. plana-E. chloromelas* (Epl-Ec)
6. *E. chloromelas-E. plana* (Ec-Epl)
7. *E. chloromelas-T. triandra - Setaria flabellata* (Ec-Tt-Sf)
8. *T. triandra-E. chloromelas - Elionurus argenteus* (Tt-Ec-Ea), all of which were associated with medium clay soils, for example from 12-20 % clay in the A-horizon
9. *E. chloromelas-T. triandra - E. argenteus* (Ec-Tt-Ea)
10. *E. argenteus-E. chloromelas - T. triandra* (Ea-Ec-Tt) associated with sandy soils with less than 12 % clay in the A-horizon
11. *Aristida diffusa-E. chloromelas* (Ad-Ec)
12. *A. appendiculatus-T. triandra* (Aa-Tt)

In each of these communities five permanent grazing exclosures, 4 m² in extent, were established. Annual aboveground phytomass production was harvested at the end of the growing season to a height of 3 cm above ground level in these exclosures; botanical composition was regularly sampled by reading 1 000 points per exclosure using a narrow spaced bridge apparatus. Annual phytomass production per grass tuft was harvested during two seasons and this material was used to determine *in vitro* digestibility of organic matter. The technique of Kruger & Edwards (1972) was used to determine the animal grazing preference for different grass species in the Egmont area.

During the period of the investigation annual rainfall at the Egmont site was generally higher than the long term average of 682 mm for this area, so that moisture stress was not an important factor influencing production. Nevertheless, annual phytomass production varied widely between years (from 3 458 kg/ha in 1975/76 to 1 513 kg/ha during 1976/77) and also between the different communities. The communities on the high clay habitat proved the most productive with an average annual phytomass yield of 3 607 kg/ha. The average production from the communities on the medium clay habitat was 2 920 kg/ha, that from the communities on the sandy soils 1 998 kg/ha, while the litholitic communities had an average annual production of 1 264 kg/ha.

There were also significant differences in phytomass production between different communities from the same habitat. The highest phytomass production was invariably harvested from those communities characterised by a high frequency of *Andropogon* or *E. plana*. Results from the investigation of phytomass production per cm² basal area of specific species, confirmed that *Andropogon appendiculatus*, *Eragrostis plana* and *Themeda triandra* were the most productive grass species in the Egmont area with an average phytomass production of 0,25-0,39 g/cm² basal tuft area.

Differences in phytomass production between the different communities were generally not related to total basal cover. Only in the case of the Aa-Tt and Ad-Ec communities on the litholitic complex, was low phytomass production associated with low grass basal cover. On all the other communities there was no relationship between phytomass production and total basal cover. Thus in the case of the Aa-Epl and Tt-Ec-Epl communities on the soils with a high clay content, average annual phytomass production varied by a factor of almost 2 in favour of the Aa-Epl community, while there was no difference in basal cover between the two communities.

Botanical surveys revealed marked changes in botanical composition over time. While the results of the ordination survey indicated floristic differences between the various communities, after five years of protection from grazing these differences had disappeared in many of the communities. *Eragrostis chloromelas*, *E. plana* and *T. triandra* were particularly dynamic constituents showing big variations in basal area over relatively short periods.

While chemical analysis indicated that the *in vitro* digestibility of the OM in *E. plana* is relatively high, varying from 68 % in summer to 46 % in winter, grazing preference studies revealed that this species is very poorly grazed by sheep and also discriminated against by cattle.

Changes in the botanical composition of the various experimental plots resulted in the termination of the investigation after five years. Differences in the acceptability of various important grass species in this area to grazing animals preclude the direct use of phytomass production for the calculation of grazing norms. The investigation did reveal large differences in phytomass production and species composition between the various communities which were studied. Without a clearer understanding of plant successional patterns, which would require more intensive sampling, it is not possible to use the data from this investigation for predicting the long term carrying capacity of the vegetation in this area.

At Glen similar grazing exclosures were erected on homogeneous grass stands occurring on the following soil series:

Soil Series	Soil Form
Arcadia	Arcadia
Bonheim } Kiora } Rasheni }	Bonheim
Glendale } Kinross }	Shortland
Graythorne	Milkwood
Mispah	Mispah

Two different grass communities, one dominated by *E. chloromelas* and the other by *T. triandra*, were sampled on the Kinross series. Communities on the warm and cooler aspects of the litholitic complex at Glen were also sampled.

During the period of the investigation annual rainfall varied from 248 mm to 718 mm compared with the long term average for this area of 523 mm. Phytomass production varied from 415 kg/ha to 2 643 kg/ha and it appeared that total rainfall is an important factor influencing phytomass production at Glen.

Large production differences between the various soil series were recorded. The Arcadia was consistently the most productive soil, yielding an average annual production of 3 622 kg/ha. Annual phytomass production from the Bonheim, Glendale and Kinross soils was only 60-67 % of that on the Arcadia, while the shallow Graythorne and Mispah soils, as well as the litholitic complex, produced less than 50 % of the phytomass produced on the Arcadias. As in the case of the Egmont investigation, there was little correlation between total basal cover and phytomass production.

Studies of the phytomass production per unit basal area confirmed that differences in production between soil series was largely due to higher tuft production on certain soils when compared with other soils. On the Arcadia soils *T. triandra* yielded on an average 0,26 g/cm² tuft area compared with 0,17 g/cm² on a Kiora and 0,19 g/cm² on a Kinross.

The water holding capacity of the different soils was determined by determining the 33 kPa and 1 500 kPa moisture percentages. Available moisture in the A-horizon varied from 11,1 % for the Arcadia soils to 5,5 % for the Mispah soils.

Although grass stands on widely differing soil series were sampled, botanical surveys indicated a very uniform vegetation cover, as far as botanical composition was concerned. The Arcadia, Bonheim, Glendale, Graythorne, Kinross (*Themeda* plots), Kiora and Rasheni plots were all characterised by a dominance of *T. triandra* which contributed 60 % or more to total cover. Although there were significant differences in the relative contribution of other grass species, there was little difference in the floristic composition of the vegetation on all these soil series. While this veld type is classified as *Themeda-Cymbopogon* veld (Acocks 1975, veld type 50), *Cymbopogon* proved to be a relatively insignificant constituent except on the Glendale and Graythorne soils and on the cooler litholitic aspects. The investigation provided little information on successional trends in this veld type, but it would appear as if the small vegetation differences observed were probably the result of previous grazing history, reflecting different series in the same successional pattern.

The value of the investigation was to indicate that very significant differences in phytomass production can occur even where there is no obvious difference in grass basal cover or botanical composition. It is clear that *Themeda triandra* is the dominant, and as far as production is concerned, the most important grass species in the Central Free State. In this investigation differences in the productivity of individual species appeared to be closely related to the water holding capacity of the soils where they occurred. In order to develop norms to predict carrying capacity, it will be necessary to obtain a clearer understanding of plant successional trends on different soils together with a knowledge of energy utilisation and mineral circulation in the different plant communities.

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A.J. Aucamp:

THE PRODUCTION POTENTIAL OF THE VALLEY BUSHVELD AS
GRAZING FOR BOER GOATS AND ANGORA GOATS
(Research Projects OK-Do. 69/1, 2, 3, 4 & 5)
D.Sc. (Agric.) : University of Pretoria. 1979
Promotor : Prof. J.O. Grunow

The Valley Bushveld constitutes approximately 19 % of the area of the Eastern Cape Region and is the largest single veld type in the region. Despite the economic importance of the veld type, not only as the basis of the mohair industry but also as a contributor to the food supply of the rapidly developing industrial region around Port Elizabeth and Uitenhage, there is a lack of information regarding veld management and animal husbandry. This led to the initiation in 1972 of a research programme in the Valley Bushveld, designed to investigate the following facets:

1. The influence of defoliation of *Portulacaria afra*;
2. the influence of rest on the quality and production of the Valley Bushveld;
3. the grazing potential of the Valley Bushveld; and
4. the productivity of *P. afra*.

A lack of dependable practical techniques to measure the growth of shrubs quantitatively can be regarded as the prime factor inhibiting research in shrub veld. The available techniques are usually either impractical or cumbersome. The high correlation ($r = 0,9743$) between shoot diameter and total shoot mass obtained in this study, presents a promising and reasonably practical technique to estimate the utilisation and regrowth after browsing of *P. afra*.

The Valley Bushveld comprises a large number of shrub species. The basal cover of the shrub layer is very low (0,338 %), whereas the canopy regime cover is high (74,45 %). This means that in veld in good condition the space available for the grazing animal is restricted and the trampling effect per unit area is severe. It was also found that the Valley Bushveld has an accumulated fodder reserve (55 358 kg/ha), but that only a small proportion of it (1 074 kg/ha) is actually available to the browsing animal for production purposes. Grasses play an important role in animal nutrition, and the encouragement of the bush-grass combination presents an opportunity to increase production per unit area. This study clearly showed that the quality of veld grazing is a less limiting factor in animal production than the quantity of forage available.

Defoliation is necessary to increase the productivity of *P. afra*. If *P. afra* is to be conserved, yet maintained in a productive state, defoliation intensities should not be lower than 25 or higher than 50 %. It appears that low intensities of utilisation with more defoliations per year may be very beneficial. The total production potential of *P. afra* can be increased by a combination of defoliation treatments; the ideal combination appears to be a moderate defoliation during the summer followed by a rest until the following autumn (approximately 15 months) when a moderate defoliation is applied, followed by a 12-month rest period. This combination enhances firstly, shoot formation and growth, and secondly, number of leaves per shoot.

This study showed that Angora and Boer goats are primarily browsers. Goats will utilise mainly browse (75 %), if it is available. It was also found that crude-protein availability should not be a limiting factor in animal production. In view of the low energy content (19,6001 MJ/kg) of the Valley Bushveld, and the high incidence of abortions in the Angora industry, serious thought will have to be given to the

energy requirements of the Angora goat in all its production stages, and whether the veld supplies those particular requirements.

It was also found that the dry-matter intake per $W^{0,75}$ kg of Angora goats (54,94 g/ $W^{0,75}$ kg), was significantly higher than that of Boer goats (48,74 g/ $W^{0,75}$ kg). This study has shown once more that animal units should be placed on a firm and more scientific basis. This information is essential for the determination of realistic stocking rates. Knowledge of the nutritional requirements of Boer goats and Angora goats in all their production stages is extremely inadequate. In view of the goat's inherent potential, research into these aspects must be regarded as a matter of urgency.

It was also found that on the same veld type Boer goats and Dorper sheep select different types of material. The introduction of a grazer in addition to goats in an animal production system presents the possibility of increasing production per unit area. Production data suggest that there is little difference between the Boer goat and Dorper sheep as regards production per hectare (13,8 and 14,2 kg/ha respectively) or production per animal (30,6 and 33,1 kg respectively). However, the results indicate a 25 % overlap in the diets of Boer goats and Dorper sheep. This overlap must be taken into account when introducing a grazer into a production system with a browser. It is clear, however, that the shrub and grass components must be utilised independently by goats and cattle (i.e. grazers).

Veld Improvement

REPLACEMENT

N-Ce.111/19(K):

VELD REPLACEMENT STUDIES IN NATAL: EFFECT ON ANIMAL PRODUCTION OF RADICAL VELD IMPROVEMENT OF VELD IN EAST GRIQUALAND BY FERTILIZING AND OVERSOWING. 1973-1978
S.F. Lesch and J.K. Arnott

This project was conducted on the farm Elandskloof in the Kokstad district of East Griqualand. It is approximately 1 700 m above sea level and has an effective annual rainfall of at least 1 500 mm (the rain mostly falling as a light drizzle). The temperatures are generally low with severe frosts and snow in winter. The soils are mainly humic phase Clovellys high in aluminium (1,5 me %) and potash (320 ppm) and low in phosphate (2,5 ppm).

The project showed over four seasons that radically improving the veld by fertilising, oversowing with an improved grass and then fortifying this sward by sod-seeding with a legume, is an economical proposition. However the use of red and white clovers as the legume was not completely successful because they tend to die out during the season after establishment.

The carrying capacity of the veld on this experiment has increased threefold from 0,7 to 2,0 mlu*/ha and the grazing duration from 210 to 240 days. The eventual aim would be to graze for 300 days (20 September to 15 July) without decreasing the carrying capacity, by closing off one camp in four for foggage.

Conception in the cow herd improved from an average 85 % on natural veld to 97 % on the improved veld. Where the veld was only able to support mature dry sheep, it is now possible to support ewes and their lambs on the improved veld.

Festuca costata is not the problem that it was first thought to be, as it is being utilised by the livestock to a certain extent, provides protection for young Cocksfoot seedlings and is not increasing. Cocksfoot on the other hand is increasing, especially when given a seeding rest during mid-summer.

According to soil analysis results there has been no significant change in the levels of nutrients except phosphate which increased from 5,0 ppm to 16,4 ppm over four seasons.

Out of a total of 117 ha 48 ha were fertilised and oversown by aircraft and when the costs of this operation were compared with those of the hand and tractor operation, it was proved to be uneconomical.

Publication

Murray, R.N., 1975. Veld reinforcement for increased meat production. *Proc. Grassld Soc. sth. Afr.* 10, 155-158.

* 1 mlu = 450 kg mature livestock unit

N-Ce.111/21(K):

VELD REPLACEMENT STUDIES IN NATAL: EFFECT ON ANIMAL PRODUCTION OF RADICAL IMPROVEMENT OF THE HIGHLAND SOURVELD (BALGOWAN) BY FERTILISING AND OVERSOWING. 1973-1977
S.F. Lesch and J.K. Arnott

The 63 ha of veld on which this trial was laid out is typical of the Highland Sourveld that occurs in Bioclimatic group 4e. It is 1 400 m above sea level and has a mean annual rainfall of 1 040 mm.

The carrying capacity of this veld is normally 0,7 mlu*/ha for 200 days. This was trebled to 2,31 mlu/ha for 198 days during the first season after the application of the treatments. However, during the subsequent seasons the carrying capacity dropped steadily to 1,97 mlu/ha for 194 days. This drop in carrying capacity was probably due to an invasion of the relatively unpalatable pioneer species *Eragrostis plana* and *Sporobolus africanus* (M'tshiki). In 1977 a botanical survey showed that 35 % of the sward was M'tshiki, 55 % was other veld grasses and plants and only 10 % was Cocksfoot and clover.

The performance of the weaners that were grown out on this trial decreased from an ADG** of 1,41 kg in 1974 to an ADG of 0,50 kg in 1976. The grazing days/mlu/ha decreased from 458 to 291 over the same period. The types of animals used in this trial were Sussex and Sussex x Afrikaner crosses.

A possible reason for the partial establishment success of the Cocksfoot and clovers was increasing competition from M'tshiki and in the case of the clover a lack of moisture as well. The surviving clover plants were only found in the low-lying wetter areas of soils which, when sampled, showed that the macro-elements are more than sufficient for optimum growth; P 48 ppm, K 115 ppm, Ca 1 445 ppm, Mg 143 ppm, Al 0,24 me %.

The following suggestions are made for future lines of research:

A more drought tolerant and acid tolerant legume than the clovers will have to be selected and it should then be sod-seeded with sufficient phosphatic fertiliser and possibly potash, into unfertilised veld. Once the legume has established itself, or within 2 or 3 months, the area should be stocked at about 1,2 mlu/ha and used for foggage. As soon as it is clear that the legume has become well established during the following season, the whole area should be topdressed with at least 25 kg P/ha and 100 kg N/ha and only afterwards oversown with Cocksfoot. The stocking rate could then be raised to about 2,5 mlu/ha for 240 days. The above treatment should reduce the effect of the invasion of M'tshiki.

* 1 mlu = 450 kg mature livestock unit

** ADG = Average daily gain

Cultivated Pastures

FEED PROGRAMMES

T.M. du Plessis:

INVESTIGATION INTO THE VALIDITY OF SOME OF THE PASTURE AND VELD NORMS USED IN BUDGET FEED PROGRAMMES IN THE UNDERBERG DISTRICT.
M.Sc.(Agric.): University of Orange Free State. 1979
Supervisor: Prof. D.P.J. Opperman

Underberg lies immediately to the east of and below the Drakensberg mountain range. The agricultural extension area comprises 200 farms, each on average 800 hectares in extent.

"Budget feeding" was introduced with a view to assisting the farmer to calculate the necessary feed required to feed his animals for all 365 days of the year. Once the amount of feed required was known, norms of quantity and quality were applied to the budget feed exercise to arrive at the number of hectares of each crop that should be grown.

After five years a check was made on the factors that could lead to shortcomings in the budget feed programme and it was decided to investigate the limiting factors in more detail by undertaking the following trials.

The dry matter yields of the eight types of pasture investigated varied enormously from the dry matter yield norms used in the budget feed exercise. The actual yield of fescue was approximately 30 % less than the fescue norm used for budget feeding.

Cocksfoot in general supplied the lowest yield of dry matter per hectare and the fescue was found to be the highest container of fibre and thus the lowest TDN supplier.

Summaries

FEED PROGRAMMES

Kikuyu (*Pennisetum clandestinum*), although having a shorter growth season, gave the highest overall dry matter yield. The addition of clover to the grass in the sward was definitely advantageous.

Irrigation on average increased the air dry-matter yield by 2,81 tons per hectare.

Non-irrigated lowland pastures, with the exception of pure clover stands, outyielded their counterparts under non-irrigated topland conditions, the reason apparently being that the lowland conditions are much cooler.

A comparison of the dry matter yields of topland irrigated Ariki ryegrass, Danish cocksfoot and Kentucky fescue pastures grown under farm conditions and under plot conditions, showed that plot yields on the average yielded 30 % more than the equivalent pastures on the farm (15,83 air dry matter/ha versus 11,91 ADM/ha).

A comparison of *Lolium multiflorum* cultivars in the Underberg area showed that over the six-month winter period, Tetila, Tetrone, Midmar, Local Hipkin and Local Hulleys were significantly superior to the other cultivars under test. Tetila, a tetraploid type, gave the highest dry matter (DM) yield of 9,77 ton/ha. During the critical July and August winter feeding period the cultivar Midmar outyielded all the others by providing 2,93 ton of dry matter/ha.

Further, it was found that the diploid cultivars outyielded the tetraploid cultivars during the mid-winter period. It is important to note that a specific cultivar should always be stated when applying a norm for budget feeding exercises in the Underberg area.

Evaluation of a trial on the productivity of natural Underberg veld with the aim of determining whether the budget feed norm was correct showed that 0,5 MLU/ha/season was not too high.

Assessment of the non-utilisation of pastures by the grazing animals on seven Underberg farms showed that on average, 26,6 % of the pasture was not utilised after one grazing.

One farmer utilised only 48,6 % of the pasture available to him. It appears that the non-utilisation of pastures by the farmer was one of the reasons why some Underberg farmers were short of feed after attempting to implement a budget feed plan.

A special trial verified certain initial results by producing an average non-utilisation of pasture figure of 39,5 %. One farmer in this trial utilised only 40 % of the available pasture at one grazing.

The highest total digestible nutrients (TDN) figure was obtained from the pure clover trial in the pasture productivity study. Clover fed to an arbitrary 275 kg beef animal would provide the best pasture for obtaining a 1 kg/day gain. Should bloat be a problem, the next best pasture, from the point of view of average daily gain, would be kikuyu, which would supply enough nutrients to allow a 275 kg animal to gain 0,85 kg/day. The addition of clover to the grass sward improved the quality of the pasture and appeared to have an economic effect on both pasture and animal production.

The current inaccuracy of as much as 39,1 % in the budget feed plan was found to be unsatisfactory.

The weaker links in the budget feed scheme formed the main focus of this work. Certain variations in accepted norms and principles in budget feeding are summarized below:

Pasture productivity studies	: up to 39,1 % variation from norm used
plot versus farm pasture yield	: up to 24,2 %
ryegrass cultivar trial	: up to 31,8 %
non-utilisation of pasture trial:	: up to 26,7 %; and
non-utilisation of pasture trial II:	: up to 39,2 %
Mean	: 32,2 %

A safety factor of 32 % extra feed necessary for feeding animals was built into eleven new Underberg budget feed schemes, with the result that no farmer who carried out his budget feed plan complained of being short of feed.

EVALUATION

OK-Do.63/5:

INTRODUCTION AND EVALUATION OF PROMISING PASTURE SPECIES IN THE EASTERN CAPE: EVALUATION OF LIVESTOCK PRODUCTION ON GREENLEAF DESMODIUM/GRASS PASTURES AT FAIRVIEW, BATHURST. 1973-1979
F.O.C.W. Karberg and J.A.G. Nell

In the south-eastern coastal region of the Eastern Cape pineapple production is a primary farming enterprise followed by stock farming as a complementary enterprise. After a five-year production cycle for pineapples the production of suitable pastures to enhance the fodder-flow programme(s) is accepted practice. Greenleaf desmodium (*Desmodium intortum*) was evaluated in combination with either Rhodes grass (*Chloris gayana* Kunth cv. Katambora), Sabi panicum (*Panicum maximum* cv. Sabi) or Bloubuffel grass (*Cenchrus ciliaris*) on the farm Fairview in the Bathurst district (26°48'E; 33°25'S). Overall animal production on these pastures was compared with natural production on sweet veld (Veld-type 7, Acocks, 1975) over four growth seasons (1973/74, 1974/75, 1975/76, 1976/77) with beef cows and calves.

The pastures yielded a high-quality feed with a crude-protein (CP) content varying from 10,1 to 14,2 % (air-dried) compared to 6,6 % for the veld grazing. Acceptability and intake of the various pasture combinations were high and enhanced animal performance. During favourable seasons beef cows (450 kg initial mass) gained 14 % in body mass up to weaning and conception rates (80-88 %) which were on a par with veld grazing. Calves gained 0,982 to 1,085 kg/day which was 12 % ($P=0,01$) higher than gains on veld.

The greenleaf desmodium/grass pastures were vulnerable to variations in the climate, especially the effective precipitation during a growth season, i.e. 13 mm and more per shower of precipitation. Although annual precipitation was 28 % above the long term mean (580 mm), the actual grazing periods varied from as low as 55 days to as high as 228 days per season. Carrying capacity also deteriorated rapidly from 290 large stock units (LSU) per ha in the first year after establishment to 171 LSU/ha in the third grazing season. The mean carrying capacity was 0,58 LSU/ha/year as compared to 0,25 LSU/ha/year for natural veld grazing.

Annual production costs amounted to R70,00/ha in 1979.

T-Rp.31/2:

EVALUATION OF *CENCHRUS CILIARIS*: THE EFFECT OF ROW ESPACEMENT, SEEDING RATE AND NITROGEN FERTILISATION. 1973-1976
C.H. Donaldson, G.T. Rootman and C. Breytenbach

The investigation was carried out at the Mara Research Station on deep granite soils (Shorrock's minus series) with an average pH (in water) of 5,8 and an average P content of 7,5 ppm. A 3x4x4 factorial design with 3 replications was used.

Mara Research Station has an average annual rainfall over a 40-year period of 415,8 mm. The rainfall recorded at the experimental site during the 1973/74, 1974/75, 1975/76 and 1976/77 seasons was 520,4; 578,9; 625,9 and 446,0 mm respectively. No season had a lower rainfall than the long-term average.

Spacing had a marked influence on DM yield (Table 1). On the average (over four seasons) and for the first three seasons the 750 mm rows yielded significantly ($P<0,01$) better than the 1 500 mm rows. The 750 mm rows treatment also yielded higher ($P<0,01$) yields than the broadcast treatment during the first two seasons and over the four-year trial period. By the fourth season spacing no longer exerted a significant influence on yield (Table 1). The latter can probably be attributed to the plant's ability to increase in size by vegetative means under favourable conditions for growth.

The effect of seeding rate on DM yields was small (Table 1). Under the experimental conditions of above-normal rainfall it was clear that established plants at the lower populations were able to expand in size and production after the first season. The results therefore suggest that high seeding rates are

unnecessary and that the recommended seeding rate of 3 kg/ha should be more than adequate for a good stand.

TABLE 1 - Mean dry-matter yields of *Cenchrus ciliaris* (t/ha)

Treatment	1973/74	1974/75	Season 1975/76	1976/77	Mean
Espacement					
E ₁ =Broadcast sowing	4,96	14,61	11,63	5,93	9,28
E ₂ =Rows 750 mm apart	5,46	16,37	12,02	5,76	9,90
E ₃ =Rows 1 500 mm apart	4,62	14,73	10,73	5,53	8,90
LSD (P<0,01)	0,43	1,05	1,17	NS	0,60
Seeding rate					
S ₁ =1,5 kg/ha	4,87	15,41	11,30	5,77	9,34
S ₂ =3 kg/ha	4,91	15,12	10,95	5,58	9,14
S ₃ =4,5 kg/ha	5,02	15,19	11,55	5,73	9,37
S ₄ =6 kg/ha	5,26	15,23	12,04	5,86	9,59
LSD (P<0,05)	NS	NS	NS	NS	NS
Nitrogen fertiliser					
N ₁ =30 kg N/ha	4,95	13,56	9,54	4,54	8,15
N ₂ =60 kg N/ha	4,88	14,94	11,33	5,60	9,19
N ₃ =90 kg N/ha	5,28	16,33	12,39	6,39	10,10
N ₄ =120 kg N/ha	4,95	16,11	12,58	6,42	10,01
LSD (P<0,05)	NS	0,93	0,89	0,43	0,37
LSD (P<0,01)	NS	1,21	1,17	0,56	0,49
Mean	5,01	15,24	11,46	5,74	9,36
Interactions	NS	NS	NS	NS	NS
Number of cuts	2	3	2	2	-

Nitrogen had a marked influence on grass production. With the exception of the first season (1973/74) the data (Table 1) revealed significant differences ($P<0,01$) for N-levels. An increase in nitrogen levels from 30 to 60 kg N/ha and from 60 to 90 kg N/ha resulted in mean increases in DM of 1,04 and 0,91 t/ha respectively, while an increase from 90 to 120 kg N/ha resulted in a mean decrease in yield of 0,09 t/ha. There is thus no advantage in increasing N applications above 90 kg N per ha.

The average responses obtained from this trial should serve as a basis for recommendations on problems related to the variables studied. The finding that nitrogen had no significant effect on yield in the first season supports the current recommendation that nitrogen should not be applied in the first season unless there are visible deficiency symptoms. The results of this experiment also suggest that buffel grass should be established in 750 mm rows at a seeding rate of 3 kg/ha and that annual nitrogen applications should not exceed 90 kg N/ha in areas with an annual rainfall of approximately 500 mm/annum.

T-Rp.31/8:

EVALUATION OF *CENCHRUS CILIARIS*: PILOT STUDY OF
A METHOD OF ESTABLISHING SEASONAL GROWTH
PATTERNS. 1972-1975

C.H. Donaldson, G.T. Rootman, C. Breytenbach and
O. le Roux

One of the essential requirements for the evaluation of a pasture plant is to establish the growth curves of the plant under normal seasonal conditions and under a standard clipping and fertiliser regime.

The growth pattern of buffel grass (*Cenchrus ciliaris* (cv. Molopo)) grown under dryland conditions was determined at the Mara Research Station over three seasons. The pasture was established on granite soils of the Shorrocks minus series during February 1971 in 750 mm rows and at a seeding rate of 3 kg/ha. The experimental area was trimmed over with a reciprocating mower at the beginning of the rainy season and limestone ammonium nitrate, single superphosphate, and potassium chloride fertilisers were applied. Duplicate plots (of 15 m² each) were cut to a stubble height of 80 mm with an autoscycyte at

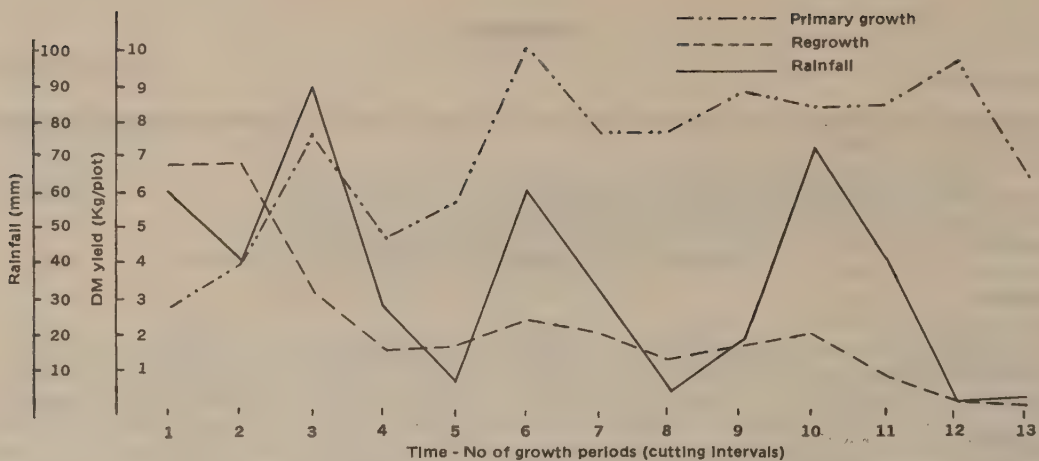


FIG. 1 - Primary and regrowth production patterns and rainfall for 1972/73 season

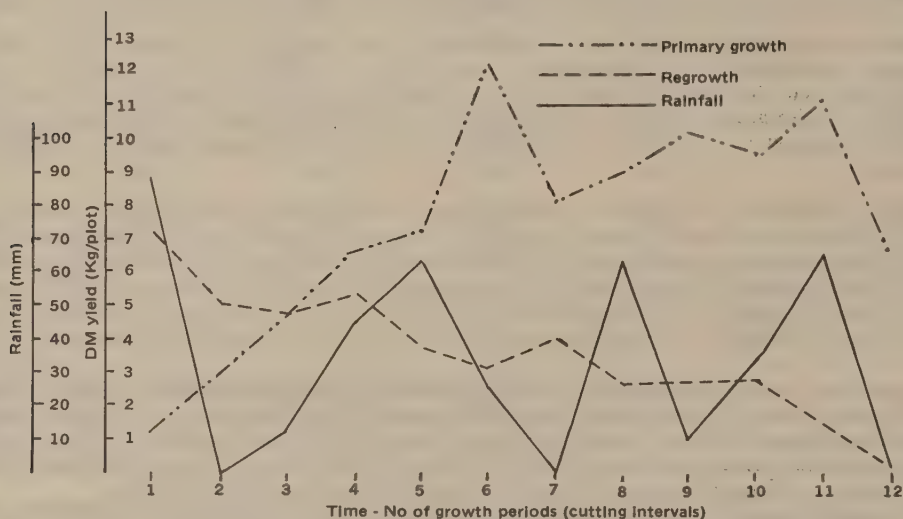


FIG. 2 - Primary and regrowth production patterns and rainfall for 1973/74 season

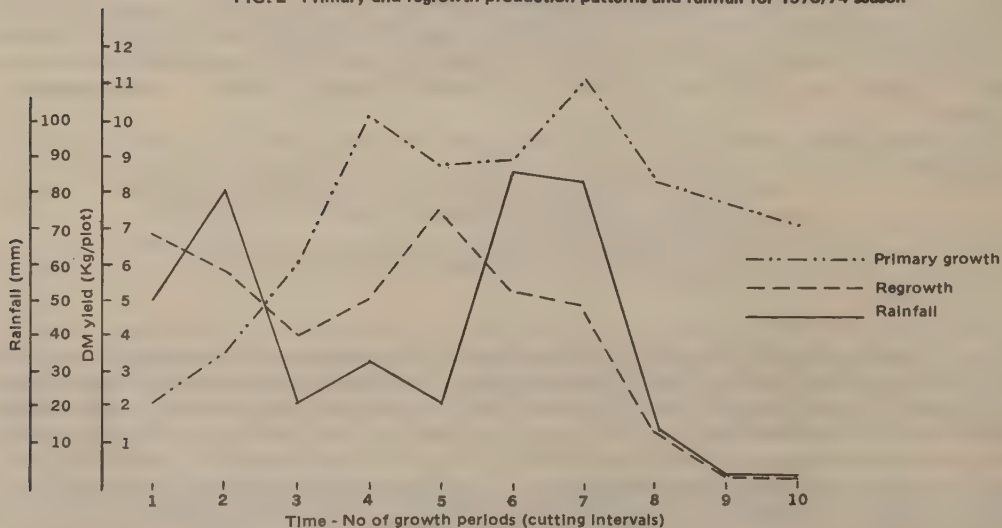


FIG. 3 - Primary and regrowth production patterns and rainfall for 1974/75 season

certain intervals throughout the growth season to determine DM yields. Different plots were cut at each cutting interval. The growth obtained from a specific cut therefore represented uninterrupted growth (primary growth) from the beginning of the growing season to the date of harvest. The regrowth from each plot was cut with an autoscythe on the same day of the last cut of the primary growth harvest. At each primary and regrowth harvest, the fresh mass production of the plot was recorded. A sample of about 500 g was dried for 24 hours at 100 °C, the dry mass measured and the yield of DM calculated. The oven-dried material of the primary growth cuts was separated into leaf and stem components. The cutting intervals during the 1972/73 season ranged from 11 to 34 days. Plots were cut sequentially at 14-day intervals during the 1973/74 and 1974/75 seasons.

The primary and regrowth data (for each cutting period) representing uninterrupted growth of dryland buffel grass from the beginning of the rainy season to the end of the growth season are presented in Figures 1, 2 and 3. Also presented is the total rainfall recorded during each harvesting period.

The growth of buffel grass increased rapidly from the beginning of the season until the 3rd growth period (Fig. 1). Growth generally declined during the 4th and 5th period followed by an acceleration of production in the 6th period. With the exception of the 12th period, growth tended to decrease after the 6th period and declined markedly during the last period of growth. There was a fairly close relationship between the total rainfall recorded during each growth period and DM yield up until the 9th period. The relatively high rainfall recorded during period 10 did not result in a rapid increase in production during this stage of growth. It would appear that the relatively drier conditions experienced during period 8 and 9 were mainly responsible for the absence of a rapid accumulation of DM during growth period 10. The good rains of period 10 followed by the follow-up rains of period 11 resulted in an increase in DM production in the 12th growth period (Fig. 1).

Maximum regrowth production occurred from the plots cut during periods 1 and 2. This was, however, followed by a decrease in regrowth yield during the rest of the periods of growth (Fig. 1).

The proportion of primary growth that consisted of leaves, declined with increasing age of the plant growth. Plant material up to the age of about 54 days contained about half its mass as leaves whilst material more than 138 days old generally contained less than 40 % of its mass as leaves.

During the 1973/74 season there was a gradual increase in primary growth from the beginning of the season until the 6th period of growth when maximum growth occurred. This was followed by a decline in production during the following two periods with secondary peaks occurring in the 9th and 11th period. There was a decline in yield in the 10th period and a marked reduction in production during the last stage of growth. The regrowth yields were highest during the first two periods and generally declined during the following growth periods (Fig. 2). The proportion of stems continued to increase up until the last harvest. On the other hand, plant growth up to the age of 32 days contained more than 50 % of its mass as leaves whilst the percentage of leaves decreased appreciably thereafter. With the exception of the 5th and 8th growth period there was a fairly close relationship between DM production and total rainfall recorded during each period of growth. The unexpected relatively poor response of buffel grass to favourable precipitations during the 5th and 8th period can largely be ascribed to the dry weather conditions experienced during the two periods of growth preceding period 5 and 8 respectively. The good rains recorded during period 5 and 6 nevertheless led to a good response in grass production during period 6 and 9 respectively (Fig. 2).

It is evident from the data in Fig. 3 that primary growth increased rapidly from the beginning of the season until the 4th period of growth, i.e. over a period of 60 days. The growth of buffel grass slowed down during the 5th and 6th period. Thereafter the growth increased and reached a maximum during period 7 followed by a gradual fall in yield over the remaining periods of growth. It is worth noting that unlike the results of the 1972/73 (Fig. 1) and 1973/74 (Fig. 2) seasons, maximum primary production in 1974/75 (Fig. 3) occurred at a relatively late stage, namely after a period of 101 days. This phenomenon can probably be attributed to the fact that very good rains fell during two successive periods of growth, namely 6 and 7. In addition it is also evident that the rainfall pattern prior to the 6th period of the 1974/75 season (Fig. 3) was also more favourable for growth than was the case in the 1972/73 (Fig. 1) and 1973/74 (Fig. 2) seasons.

The rainfall pattern of the 1974/75 season probably accounted for the maximum regrowth yields during period 5 (Fig. 3) instead of during the first two periods as was the case for the 1972/73 and 1973/74 seasons. Another striking feature of the 1974/75 data was that plant growth containing more than 50 % of leaves was limited to the first 19 days of growth, compared to the 54 and 32 days of favourable leaf production attained during the respective 1972/73 and 1973/74 seasons. Periods of maximum yield, however, occurred much later during these growth seasons, namely 124, 88 and 60 days for the respective 1972/73, 1973/74 and 1974/75 seasons. Clearly an increase in yield after and about these dates was due essentially to an increase in stem production.

In order to obtain the proper use of buffel grass, one should aim at optimising yields of high quality herbage. It is known from local research work that the nutritive value of this grass decreases rapidly with increasing age. Therefore, the longer one delays utilising the grass, the lower falls its digestibility. This is supported by the present finding that leaf growth (if leaves are accepted as being more nutritious than stems) declined markedly after the first 19, 32 or 54 days (depending on the season) of the growth season. It would therefore seem that on consideration of pasture quality alone, the intervals between grazing cycles (in a rotational grazing management system) should not be longer than the time taken for the pasture to reach the optimum leaf stage.

Conclusions

Although the technique employed in the present study was in many respects unsatisfactory, the following interesting findings emerged from the trials and may require further investigation:

1. When the primary (uninterrupted) growth yields of dryland buffel grass were plotted together with rainfall against time, it was found that there were certain periods during the growth season when the yield of uninterrupted growth declined. These periods of yield-decline appeared to be related to temporary periods of moisture and heat stress (Fig. 1, 2 and 3). Although the data may be rather sketchy, one is tempted to speculate whether these stress conditions might have stimulated the redistribution of, for example, carbohydrates from either the above-ground parts to the roots or from the leaves to the stems.
2. An interesting feature of the regrowth curves obtained from dryland buffel grass was the pattern of the curves and the primary growth production curves (Fig. 1, 2 and 3). It is worth noting that slow recovery rates and relatively low yields of the aftermath growth were recorded from plots cut at the more advanced stages of plant growth. Although it may be suggested that this finding was due to a depletion of soil nutrients and/or photosynthetic material, more research is required to explain this phenomenon.

The growth curve of pasture plants can generally be established by means of fairly simple procedures. If the growth curve data are to be of any practical and scientific value, such studies should be combined with different management practices such as frequency, intensity and type of defoliation under varying climatic and soil fertility conditions. Quantity and distribution of rainfall (or irrigation), soil moisture and soil nutrient content, air and soil temperatures, day length, nutritive value of the cut or grazed herbage, etc., are factors which need to be accurately monitored. It should also be borne in mind that the problem of deciding at which time a pasture should be harvested, is further complicated by the fact that the productive units of the pasture (the leaves) are also that part of the pasture which is preferentially grazed by stock.

T-Rp.31/9:

EVALUATION OF *CENCHRUS CILIARIS*: EVALUATION OF *C. CILIARIS* ECOTYPES IN TERMS OF DRY-MATTER INTAKE, 1973-1977 C.H. Donaldson and G.T. Rootman

A trial was run at Rooideplaas with the aim of obtaining preliminary quantitative data on the hay intake of nine buffel grass types and three different grass species.

Digitaria smutsii, *Panicum maximum* (Nanyuki), *Anthephora pubescens* and nine selected ecotypes of *Cenchrus ciliaris* were sown during February 1973 on a Hutton soil series at Rooideplaas. A plot size of 8 x 30 m and two replications per grass variety were used. Sufficient phosphate and nitrogen applications were made throughout the course of the experiments.

Four, three and two hay cuts were taken during 1973/74, 1974/75 and 1975/76 seasons. Herbage samples were also taken at three stages of growth from all plots during the last season of the trial for *in vitro* DM digestibility determinations. Herbage representing young leafy regrowth was obtained from the regrowth after the second hay cut. All plots were also sampled at a late-leaf stage (approximately 6 weeks growth) prior to the first hay cut. Samples of mature herbage were obtained from a portion of the plots rested for the entire growing season.

Milled grass hay was fed twice daily to one-year-old Dorper wethers in measured amounts equal to 4% of each sheep's live mass.

The results of the hay intake of 12 grasses obtained in each season as well as the mean intake values for the whole experimental period are presented in Table 1.

The voluntary intake of hay varied from 59,3 to 84,0 g/kg $W^{0.75}$, according to grass cultivar and season. The lowest intake was obtained from *C. ciliaris* (cv. Biloela) during 1974/75 and the highest from *Digitaria smutsii* during 1973/74 (Table 1). Treatment differences were highly significant ($P < 0,01$) for

each of the three seasons. The mean intake of hay per season over the three years did not differ significantly (Table 2).

A striking feature of the data (Tables 1 & 2) is that the voluntary intake differences between grasses were not consistent from one year to the next, but from the overall three seasons' mean intake data it is evident that *Anthephora pubescens* gave the highest intake and *C. ciliaris* (Biloela) the lowest. Considering the overall mean intake values per season over the three seasons, it seems that three groups (based on voluntary intake values) are identifiable. The first group comprises *C. ciliaris* (Biloela) and *C. ciliaris* (Tarewinnebar) which gave the lowest mean daily intake values of 62,43 and 52,67 g/kg $W^{0,75}$, respectively (Table 1). The second group is represented only by *Anthephora pubescens* with a mean intake value superior to the values obtained for the other grasses. The relatively low intake value obtained for *A. pubescens* during the 1974/75 season is possibly due to the fact that the leaves of this grass were heavily infested with rust during this season. The third group is made up of the remaining nine grasses with intake values intermediate to those of the first two groups.

TABLE 1 - Hay intake (g/kg $W^{0,75}$) by sheep of different grass species and ecotypes

Grass No.	Grass species	Ecotype/cultivar	Hay intake			Mean 1973/76
			1973/74 season	1974/75 season	1975/76 season	
1	<i>Anthephora pubescens</i>	Commercial	77,1	66,3	80,4	74,60
2	<i>Digitaria smutsii</i>	Commercial	84,0	62,3	61,0	69,10
3	<i>Panicum maximum</i>	Nanyuki	65,9	66,9	68,7	67,17
4	<i>Cenchrus ciliaris</i>	Molopo	70,3	64,3	74,3	69,63
5	<i>C. ciliaris</i>	V.H.	66,2	74,3	65,3	68,60
6	<i>C. ciliaris</i>	29	68,0	72,5	64,9	68,47
7	<i>C. ciliaris</i>	36	69,2	62,7	73,3	68,40
8	<i>C. ciliaris</i>	42/8	65,6	65,1	69,7	66,80
9	<i>C. ciliaris</i>	UP	63,0	59,8	77,6	66,80
10	<i>C. ciliaris</i>	44	69,9	61,3	66,6	65,93
11	<i>C. ciliaris</i>	Tarewinnebar	61,4	61,7	64,9	62,67
12	<i>C. ciliaris</i>	Biloela	60,6	59,3	67,4	62,43
CV %			12,3	6,0	11,2	9,1
LSD ($P < 0,05$)			9,02	4,52	9,90	NS
LSD ($P < 0,01$)			12,00	6,01	13,17	NS

Statistical comparisons and rankings for voluntary intake of all treatments are given in Table 2. Intake was expressed on a metabolic size basis as g/kg $W^{0,75}$ /day.

TABLE 2 - Statistical comparisons and ranking for voluntary intake

Season	Comparisons at 5 % level of significance	Comparisons at 1 % level of significance	Ranking for voluntary intake
1973/74	1>3,5,6,8,9,11,12 2>3,4,5,6,7,8,9,10,11,12 4>12 10>12	1>9,11,12 2>3,4,5,6,7,8,9,10,11,12	2>1>4>10>8>6>5 3>7>9>11>12
1974/75	1>9,10,12 3>2,9,10,11,12 4>12 5>1,2,3,4,7,8,9,10,11,12 6>1,2,3,4,7,8,9,10,11,12 8>9,12	3>12 5>1,2,3,4,7,8,9,10,11,12 6>1,2,4,7,8,9,10,11,12	5>6>3>1>7>4 >8>2>11>10>9>12
1975/76	1>2,3,5,6,8,10,11,12 4>2 7>2 9>2,5,6,10,11,12	1>2,5,6,10,11 4>2 9>2	1>9>4>8>7>3>12 10>5>11>6>12
Mean			1>4>2>5>6>8>3
1973/74-1975/76	Differences non-significant	Differences non-significant	>7=9>10>11>12

The percentage *in vitro* organic matter digestibility (IVOMD) of the herbage of 12 grasses cut at different physiological stages of growth varied from 39,0 to 75,3 % according to grass variety and stage of growth. As expected, the results showed a depression in digestibility with increasing maturity (Table 3).

The most interesting feature of the results shown in Table 3 is the relatively small range of digestibility found within and between grass species cut at the early leafy and late leaf to early piping stages of growth and the wider range in digestibility of the herbage cut at the mature stage of growth. The maximum difference (range) between the 12 grasses in IVOMD at the early leafy, late leaf to early piping and mature stages of growth was 6,0; 6,3 and 16,5 percentage units representing 8,7; 10,1 and 42,3 % differences respectively.

TABLE 3 - Percentage *in vitro* organic matter digestibility of 12 grasses at different physiological stages of growth

Grass No.	Grass species	Ecotype/cultivar	Early leafy stage	Late leaf to early piping	Mature stage	Mean
1	<i>Anthephora pubescens</i>	Mixed types	72,2	63,2	44,6	60,0
2	<i>Digitaria smutsii</i>	Mixed types	73,1	66,9	42,5	60,8
3	<i>Panicum maximum</i>	Nanyuki	70,2	65,7	55,5	63,8
4	<i>Cenchrus ciliaris</i>	Molopo	70,0	68,1	47,2	61,8
5	<i>C. ciliaris</i>	V.H.	72,9	67,3	53,9	64,7
6	<i>C. ciliaris</i>	29	69,3	68,5	49,4	62,4
7	<i>C. ciliaris</i>	36	70,3	62,2	54,7	62,4
8	<i>C. ciliaris</i>	42/8	70,0	66,1	49,4	61,8
9	<i>C. ciliaris</i>	U.P.	71,7	69,3	-	-
10	<i>C. ciliaris</i>	44	71,4	68,0	53,4	64,3
11	<i>C. ciliaris</i>	Tarewinnebar	75,3	65,4	51,4	64,0
12	<i>C. ciliaris</i>	Biloela	73,2	68,3	39,0	60,2
Mean <i>C. ciliaris</i> types			71,6	67,0	49,8	62,7
Mean other species			71,8	65,3	47,5	61,5

Although voluntary intake and IVOMD determinations of grass hay are generally accepted as good measures of the nutritive value of a plant, this trial has at least revealed that there are many other factors which must be carefully considered if pasture plants are to be validly assessed with these techniques. It can nevertheless be concluded that under the conditions adopted in this experiment, the relative value of the hay of the Molopo cultivar of *C. ciliaris* was for all practical purposes equal to the hay of the other cultivars of this species.

T-Rp.31/11:

EVALUATION OF *CENCHRUS CILIARIS*: AN INVESTIGATION OF THE PRODUCTION VALUE OF MEDIUM-QUALITY *CENCHRUS CILIARIS* HAY. 1975-1979

J.P. Pienaar, P.J.K. Morgan and L. Grattarella

In this study with cannulated sheep, a few factors governing the voluntary intake of roughage were determined. It was found that rumen capacity, speed of fermentation, solubility of the feedstuff and the insoluble fermentable portion thereof were identified as important variables. The flow of the fermentable and non-fermentable organic material of the rumen was found to be constant irrespective of differences in the quality of the roughages. As a result of this a first order regression model was used to forecast the voluntary intake of roughage with a high degree of accuracy.

FERTILISER

T-Rp.31/5:

EVALUATION OF *CENCHRUS CILIARIS*: NITROGEN FERTILIZER APPLIED ACCORDING TO SOIL MOISTURE AND RAINFALL. 1972-1979

C.H. Donaldson, B.H. Robinson, G.T. Rootman, C. Breytenbach and O. le Roux

The experiment was conducted at three sites, namely Roodeplaat, Mara and Towoomba Research Stations, on soils of the Sibasa, Shorrocks minus and Shorrocks plus series respectively. The mean

long-term annual rainfall for Roodeplaat, Mara and Towoomba and the average annual rainfall for the three experimental sites over the four-year trial period were 604,4 and 415,8; 551,8 and 731,5; 551,4 and 723,3 mm respectively.

The buffel grass (*Cenchrus ciliaris* cv. Molopo) pastures were established in 750 mm rows on lands during February 1971. A basal application of single superphosphate (8,3 % P) was applied before establishment at the rate of 20 kg P/ha. Subsequently each plot was uniformly fertilised in spring with 200 kg superphosphate (8,3 % P) per ha and 100 kg potassium chloride (50 % K) per ha.

A randomised block design comprising 12 treatments with 3 replications per site was used.

Nitrogen fertilizer was applied as limestone ammonium nitrate (30 % N) to each of the following treatments:

Treatment No.	kg N/ha	Distribution of N-fertilizer
1	45	7,5 kg N/ha applied at monthly intervals (Oct. to March)
2	90	15,0 kg N/ha applied at monthly intervals (Oct. to March)
3	135	22,5 kg N/ha applied at monthly intervals (Oct. to March)
4	180	30,0 kg N/ha applied at monthly intervals (Oct. to March)
5	45	Varying monthly applications (Oct. to March)
6	90	Varying monthly applications (Oct. to March)
7	135	Varying monthly applications (Oct. to March)
8	180	Varying monthly applications (Oct. to March)
9	See Tables 1, 2, 3	10 kg N/ha applied monthly (Oct. to March) when soil was dry or 20 kg N/ha applied when soil was wet
10	See Tables 1, 2, 3	20 kg N/ha applied monthly when soil was dry or 40 kg N/ha applied monthly when soil was wet
11	See Tables 1, 2, 3	20 kg N/ha applied immediately after a fall of rain of at least 25 mm (Oct. to March)
12	See Tables 1, 2, 3	40 kg N/ha applied immediately after a fall of rain of at least 25 mm (Oct. to March)

Treatments 1 to 10 were applied at the beginning of each of the months October, November, December, January, February and March.

The varying monthly N levels for treatments 5, 6, 7 and 8 were adjusted for each site as follows:

Roodeplaat

Treatment 5: Rates of 5,3; 8,4; 9,2; 8,0; 7,8 and 6,3 kg N/ha during October, November, December, January, February and March respectively.

Treatments 6, 7 and 8: Nitrogen applied at monthly intervals at two, three and four times the respective levels of treatment 5.

Mara

Treatment 5: Rates of 3,5; 8,3; 10,2; 9,9; 7,3 and 5,8 kg N/ha during October, November, December, January, February and March respectively.

Treatments 6, 7 and 8: Nitrogen applied at monthly intervals at two, three and four times the respective levels of treatment 5.

Towoomba

Treatment 5: Rates of 3,6; 8,3; 10,2; 9,9; 7,2 and 5,8 kg N/ha during October, November, December, January, February and March respectively.

Treatments 6, 7 and 8: Nitrogen applied at monthly intervals at two, three and four times the respective levels of treatment 5.

Rooideplaar trial

The annual and 4-year average DM yields of the 12 nitrogen treatments appear in Table 1.

TABLE 1 - Effect of N-levels on DM Yields at Rooideplaar

Treatment Number	1972/73		1973/74		1974/75		1975/76		Mean 1972/76	
	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha
1	45	6,57	45	6,29	45	8,01	45	6,45	45	6,83
2	90	7,46	90	7,99	90	11,58	90	6,68	90	8,43
3	135	7,04	135	10,34	135	18,83	135	10,76	135	11,74
4	180	7,90	180	10,52	180	19,54	180	11,92	180	12,47
5	45	5,84	45	5,72	45	7,71	45	5,98	45	6,31
6	90	6,93	90	8,18	90	12,93	90	7,33	90	8,84
7	135	8,06	135	10,39	135	16,72	135	10,68	135	11,46
8	180	7,90	180	8,83	180	16,90	180	11,13	180	11,19
9	80	6,59	60	8,02	100	10,58	90	7,34	82	8,13
10	160	6,03	120	9,43	200	16,93	180	10,99	165	10,85
11	105	6,96	140	10,43	200	20,63	165	11,62	153	12,41
12	210	7,98	280	14,20	400	24,39	330	15,79	305	15,59
Mean		7,10		9,19		15,39		9,72		10,35
CV %		10,36		17,04		14,93		12,19		10,17
LSD<0,05		1,91		2,71		1,07		2,43		1,74
LSD<0,01		-		3,69		1,45		3,30		2,37
Number of cuts	3		3		3		3		-	

The data (Table 1) for each of the four seasons revealed significant differences ($P<0,05$) for N-levels. The response to nitrogen in the last three seasons and on the average over four seasons was highly significant ($P<0,01$). It is also evident from the data (Table 1) that buffel grass generally responded to N-levels at least as high as the maximum.

Towoomba trial

The effect of 12 nitrogen treatments on the DM production of buffel grass over a 4-year period are given in Table 2.

TABLE 2 - Effect of N-levels on DM Yields at Towoomba

Treatment Number	1972/73		1973/74		1974/75		1975/76		Mean 1972/76	
	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha
1	45	2,82	45	10,44	45	5,89	45	3,50	45	5,66
2	90	3,42	90	11,29	90	7,13	90	6,26	90	7,03
3	135	3,66	135	13,16	135	8,01	135	8,90	135	8,43
4	180	4,42	180	15,09	180	10,65	180	10,90	180	10,27
5	45	3,08	45	7,93	45	5,54	45	3,40	45	4,99
6	90	4,29	90	11,00	90	7,58	90	6,76	90	7,41
7	135	3,93	135	13,49	135	9,57	135	8,59	135	8,90
8	180	4,98	180	17,84	180	12,65	180	11,03	180	11,63
9	40	2,89	160	13,51	90	9,00	140	8,23	108	8,41
10	80	4,97	220	17,04	180	11,43	280	11,44	190	11,22
11	80	3,04	220	17,20	120	14,38	120	8,61	135	10,81
12	160	4,54	280	19,20	240	15,08	240	11,63	230	12,61
Mean		3,84		13,93		9,74		8,27		8,95
CV %		27,27		10,32		15,09		8,87		5,85
LSD<0,05		NS		2,67		2,70		1,91		0,89
LSD<0,01		NS		3,63		3,67		2,59		1,28
Number of cuts	1		3		2		2		-	

The first season's (1972/73) yields produced no significant differences between treatments (Table 2). The low rainfall of the 1972/73 season was responsible for the low DM yield obtained in this season. The response to nitrogen in the ensuing seasons and on the average (four seasons) was highly significant ($P<0,01$) (Table 2). The average results of the Towoomba trial were similar to the results of the Rooideplaar trial, indicating progressive increases in yield with increased levels of nitrogen fertilizer applications.

Mara trial

The seasonal effects of different levels of nitrogen fertiliser and the 4-year average effects of these treatments on the DM yields of buffel grass are presented in Table 3.

TABLE 3 - Effect of N-levels on DM Yields at Mara

Treatment Number	1972/73		1973/74		1974/75		1975/76		Mean 1972/76	
	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha	kg N ha	DM Yield t/ha
1	45	4,53	45	7,43	45	5,23	45	6,03	45	5,81
2	90	3,91	90	5,84	90	6,33	90	5,60	90	5,42
3	135	4,43	135	7,87	135	8,60	135	8,33	135	7,31
4	180	4,95	180	7,83	180	9,40	180	8,40	180	7,65
5	45	4,48	45	8,07	45	6,23	45	6,77	45	6,39
6	90	4,24	90	7,50	90	6,50	90	6,73	90	6,24
7	135	3,67	135	7,17	135	7,13	135	6,23	135	6,05
8	180	4,47	180	5,57	180	8,50	180	8,07	180	6,65
9	60	4,72	80	8,37	30	5,37	40	5,43	53	5,97
10	103	4,43	133	8,00	81	7,17	80	6,70	99	6,58
11	180	3,59	160	8,03	140	7,87	120	7,33	150	6,83
12	360	4,18	275	7,57	280	9,17	240	6,97	288	6,97
Mean		4,30		7,44		7,29		6,88		6,48
CV %		19,87		22,28		12,2		16,32		12,81
LSD<0,05		NS		NS		2,09		2,36		NS
LSD<0,01		NS		NS		2,85		NS		NS
Number of cuts	3		3		3		2			

The 1972/73 and 1973/74 seasons' results revealed no significant treatment differences. The response to nitrogen in the 1974/75 and 1975/76 seasons was, however, significant. The latter was probably due to the relatively high rainfall recorded during these two seasons. The 4-year means showed no significant differences between nitrogen treatments.

The response of buffel grass to nitrogen at Roodeplaat, Towoomba and Mara is in general agreement with the results obtained from other nitrogen fertiliser trials conducted at these sites. It can be concluded from the data (Tables 1, 2 and 3) that no method of adjusting the level of nitrogen according to seasonal conditions appeared to have any advantage over equal monthly rates of application. The yields when nitrogen was applied according to soil moisture or after effective rains, were disappointingly low when the amount of applied nitrogen is taken into consideration. The trial produced very little valuable results. This can largely be ascribed to the fact that no valid comparisons could be made between fixed nitrogen application treatments and treatments in which nitrogen rates varied according to soil moisture and rainfall. The rate of nitrogen applications according to soil moisture and rainfall should have been adjusted in such a way that end of season totals were equivalent to the equal monthly nitrogen treatments.

FIELD CROPS

OK-Do.55/7:

UTILISATION OF FIELD CROPS AS ANIMAL FEED:
ERAGROSTIS CURVULA (ERMELO) FOR DAIRY COWS.
 1971-1973
 W.P. Henning, H.H. Barnard

Complete *ad libitum* diets compounded from hammer-milled (12 mm mesh) *Eragrostis curvula* hay and energy concentrates were fed individually indoors to Friesian dairy cows over a 300-day lactation period. The diets were mixed in the ratio of 70:30, 50:50 and 30:70::hay: concentrate.

A summary of the production data is given in Tables 1 and 2.

TABLE 1 - Mean daily yield of fresh milk, 4 % FCM, butterfat, SNF and gain in body mass per cow

Treatment	Milk yield					Quality aspects					Daily gain in body mass kg	Change in body mass %
	Fresh		Industrial (4 % FCM)		%	Butterfat		Solids-non-fat		%		
	kg	relative	kg	relative		kg	relative	kg	relative			
1	13,1	100	12,48	100	3,71	0,483	100	8,225	1,077	100	0,115	6,3
2	15,5	118	14,57	117	3,66	0,559	117	8,409	1,303	121	0,128	7,3
3	17,2	131	15,86	127	3,53	0,599	125	8,424	1,449	135	0,249	13,7
LSD(0,05)	2,2		2,00		0,076						0,149	8,7
LSD(0,01)	3,1		2,81		0,106						0,209	12,1
SE	±0,708		±0,65		±0,025						±0,048	±2,8

FCM = Fat-corrected milk

SNF = Solids-non-fat

TABLE 2 - Efficacy of the diets for milk production

Treatment	Milk yield per 100 kg TDN consumed			
	Fresh		Industrial (4 % FCM)	
	kg	Relative	kg	Relative
1	121,940	100	116,944	100
2	130,220	107	122,220	111
3	124,530	102	114,581	107
LSD(0,05)	18,51		16,297	
LSD(0,01)	25,95		22,849	
SE	±6,006		±5,289	

TDN = Total digestible nutrients

FCM = fat-corrected milk

Decreasing levels of *E. curvula* hay were accompanied by an increase of 4 and 14 % respectively ($3 > 2^* > 1^{**}$) in dry-matter intake. Consequently the intake of higher levels of productive energy led to increased milk yields (4 % fat-corrected milk) of 17 and 27 % respectively ($1 < 2^*, 3^{**}$). Qualitative changes in the milk were brought about; butter-fat percentage decreased ($1, 2 > 3^*$) and solids-non-fat increased ($3 > 2 > 1$ NS). Cows consumed 117, 131 and 152 % respectively of daily energy requirements for a standardised cow (National Research Council, 1966) of 600 kg, yielding 15 kg of 4 % fat-corrected milk. Surplus energy intakes were diverted progressively into higher daily body gains ($3 > 2 > 1$ NS). Therefore the efficacy of the diets, in terms of milk yield per unit total digestible nutrient intake, was not particularly

TABLE 3 - Gross profit margins above feed costs for fresh and industrial milk

Treatment	DMI per day		Feed cost per			Milk yield (daily)		Value of milk (daily)		Gross profit margin					
	kg feed	day	litre fresh	milk Indus. 4 % FCM	Fresh	Indus- trial 4 % FCM	Fresh	Indus- trial 4 % FCM	per day	Fresh		Industrial 4 %			
										per litre	relative	FCM			
												per day	per litre	relative	
kg	cents	cents	cents	cents	kg	kg	cents	cents	cents	cents	(days)	cents	cents	(days)	
1	17,53	5,48	96,1	7,32	7,70	13,12	12,48	196,8	32,1	100,7	7,7	105	35,0	2,8	946
2	18,29	6,80	124,4	8,01	8,54	15,52	14,57	232,8	153,0	108,4	7,0	113	28,6	2,0	773
3	20,05	8,12	164,8	9,45	10,26	17,23	15,86	258,4	166,5	95,6	5,6	100	3,7	0,24	100
Feed prices:	Maize meal		-			R100/t									
	Fish meal		-			R330/t									
	Peanut oil cake		-			R139,14/t									
	Wheaten bran		-			R65,58/t									
	<i>E. curvula</i> hay		-			R35,00/t									
	Bone meal		-			R147,00/t									
	Salt		-			R43,80/t									
	Fresh milk		-			R0,15/l									
	Industrial milk		-			R0,105/l									

DMI = dry-matter intake

FCM = fat-corrected milk

enhanced by the higher energy intakes. Cows consumed 81, 114 and 150% of standardised daily crude-protein requirements. Milk yield was thus not optimised on diet 1, due to insufficient crude-protein intake.

Mineral intakes (calcium, phosphorus) were on a par with or above standard requirements.

Gross profit margins above feed costs were calculated, using 1979 feed and milk prices (Table 3). The gross profit margins were marginal for industrial milk (4% fat-corrected milk) but ranged from 5,6 to 7,7 cent per litre for fresh milk.

Supporting Research

GENETICS

N-Ce.119/3: A SURVEY OF THE MODE OF REPRODUCTION OF CERTAIN GRASSES AND LEGUMES IN SOUTH AFRICA. *CHLORIS GAYANA*. 1970-1980
J.M.L.C. Rhind

The chromosome numbers of 27 accessions of *Chloris gayana* collected at various localities in southern Africa, or obtained from local seed merchants, were determined.

All accessions were diploid ($2n=20$) and no mitotic abnormalities were observed in the cells studied. This finding is in agreement with those of other workers reported in the literature.

In view of the rationalisation of the pasture breeding programme, the allocation of a low priority to this species in terms of the Natal Regional Development programme, and inadequate staff to continue this work, the project is being terminated.

N-Ce.119/4: A SURVEY OF THE MODE OF REPRODUCTION OF CERTAIN GRASSES AND LEGUMES IN SOUTH AFRICA: *DIGITARIA SMUTSII*. 1970-1980
J.M.L.C. Rhind

The dry matter yields of 63 selections of *Digitaria smutsii*, selected from 100 accessions collected at various localities in South Africa, ranged from 11 169 kg/ha to 5 742 kg/ha over a two year period. The commercial cutliver "Irene" yielded 9 029 kg/ha.

After a programme of recurrent selection and polycross and progeny testing, the five most promising selections were constituted as a synthetic. A comparison between the local synthetic and cv. Irene revealed that the former offered no agronomic advantage and no improvement in seed set or seed germination capacity, both of which are inherently poor in *D. smutsii*, was achieved.

Due to rationalisation of the pasture breeding programme, the allocation of a low priority to this species in terms of the Natal Regional Development programme, and insufficient staff to undertake cytogenetic investigations necessary in this project, the project is being terminated.

RESOURCE UTILISATION

CLASSIFICATION AND PLANNING

Agrometeorology

CLIMATE

- (A)S-Pr.54/5: THE OCCURRENCE OF MINIMUM TEMPERATURES AT DOUGLAS
AND THEIR PREDICTION. 1976-1978
R. Eicher

Without conducting a prior investigation into the occurrence of sub-zero temperatures during October, farmers in the Douglas area switched from field crop production to sultana production. Only after producers suffered losses due to frost, was an agrometeorological study requested.

A topoclimatic study was conducted in the Bucklands area near Douglas to quantify the distribution of minimum temperatures in relation to topography. This study showed that areas of poor air drainage are unnecessarily exposed to temperatures below 0°C and that the duration of exposure is also much longer than in well-drained areas. By taking measures to improve air drainage, the risk of frost damage is diminished.

In conjunction with the topoclimatic study an attempt was made at developing a simple formula for forecasting minimum temperature. Two excellent formulae were developed which both require the dewpoint temperature at 20h00 (Td). The formula which gave the best results during the months of September and October is of the form $\frac{1}{2}(T_x + T_d) - C$ where T_x is the maximum temperature and C a constant.

RESOURCE CONSERVATION

Soil Conservation

- M.L. Heyns: STRIVING AS A FACTOR DETERMINING BEHAVIOUR BY
TRANSGRESSORS OF THE SOIL CONSERVATION ACT (1969).
(Research Project K-VI.16/1)
M. Inst. Agrar : University of Pretoria. 1979
Supervisor: Prof. G.H. Düvel

The findings based on data obtained by means of personal interview schedules from a group of trespassers of the Soil Conservation Act (Act 76 of 1969) in the Karoo Region provides adequate evidence supporting the hypothesis that both trespassing or compliance with the provisions of the relative Act are determined by striving.

The incompatibility of Items 9, 10 and 12 of the general provisions in pursuance of the objects of the Soil Conservation Act (1969) with the situations of the respondents crystallised as being the main obstacles in the implementation of this Act.

Physical and psychological obstacles resulted in the suppression of striving after veld improvement, separation of veld types, resting of veld and improvement in carrying capacity by 81 % of the respondents.

Furthermore 77 % of the respondents considered the Items as unworthy to strive after while the strivings of 39,7 % of the respondents were incompatible with the compliance of the provisions of the Soil Conservation Act.

WEED CONTROL

Weeds and Poisonous Plants Research

NASSELLA

OK-Do.68/8:

CONTROL OF UNDESIRABLE PLANT SPECIES IN NATURAL
VEGETATION : APPLICATION OF GLYPHOSATE ON NASSELLA AT
DIFFERENT TIMES AND RATES. 1978-1979
A.J. Aucamp and B.D. Viljoen

The effect of date of application of glyphosate at the rates of 2, 4, 6 and 8 litres/ha on Nassella in Dohne Sourveld was investigated using a randomised block split plot design with three replications.

The results were assessed using the European Weed Research Council (EWRC) rating. At 8 litres/ha the control of Nassella was highly satisfactory except when applied during December, January and July. At the other application rates, control was unsatisfactory. A weakness of this trial was the subjectivity of the EWRC ratings.

PROSOPIS

K-Gf.126/2:

SURVEY OF *PROSOPIS* DISTRIBUTION IN THE KAROO
REGION. 1976-1977
M. Vorster

The greatest concentration of *Prosopis* trees and shrubs is found in the north-western parts of the Karoo Region.

Prosopis concentrations are thinly scattered over the greater part of the infested area, which amounts to about 10 % (186 677 ha) of the total area of the farms included in the survey. Although the plains are the most subjected to infestation, all the other veld types are infested in a varying but lesser degree.

Prosopis is not an indigenous species, but was planted in the north-west Karoo in the earlier years for fodder and shade. Due to the wide ecological adaptability of this species it was rapidly spread by animals and flood waters to other parts of the Karoo Region.

No specific *Prosopis* species could be identified, but Prof. C.E. Fisher from Texas University in the USA who visited some of the infested areas, was of the opinion that at least three species are involved.

The most important advantages of *Prosopis* are the high nutritive value of the generally well-utilized pods and the provision of shade to animals. Ousting of natural veld is the greatest disadvantage of *Prosopis*.

Hand eradication is at present the most widely used control method and has proved reasonably successful. Mechanical and chemical methods, alone or in combination, were successful to reasonably successful. In general chemical control has proved to be the most successful method.

SUNDRY WEEDS

(A)T-Rp.111/2:

EVALUATION OF NEW HERBICIDES FOR DECIDUOUS FRUIT
AND STRAWBERRIES IN THE SUMMER RAINFALL AREA.
1971-1980
Ruth Meissner

1. The control of perennial weeds, *Cyperus rotundus* and *Cynodon dactylon*, in deciduous fruit orchards in the summer rainfall area

In the deciduous fruit orchards and vineyards of the summer rainfall area, red nutgrass (*Cyperus rotundus* L.) and common quick grass (*Cynodon dactylon* (L.) Pers.) are very troublesome weeds. Up to the present in such localities no herbicide has been available for their control, apart from paraquat (1,1'-dimethyl-4,4'-bipyridylium) which kills annual weeds by contact action but has little or no impact on perennial weeds. When glyphosate (N-(phosphonomethyl)glycine) became available for test purposes, a series of trials were carried out during the years 1971-1973. Glyphosate is a post-emergence herbicide which is translocated through and has a long-lasting residual effect in the plants.

The object of the trial was to investigate the performance of glyphosate on the perennial weeds under local climatic conditions in orchards, where the soil is usually little disturbed by cultivation.

The trials were carried out in an apricot and a peach orchard and in a vineyard. All the trees and grape-vines were at least eight years old with mature bark. Of the weed population 80 % consisted of the perennials *C. rotundus* and *C. dactylon*; the rest was the usual combination of annual broadleaf weeds and grasses. At the beginning of the tests, the weeds which had been slashed a fortnight previously, were growing vigorously. Different rates of glyphosate (formulated as MON-1139) were applied, first on 22 November 1971, followed by the second application on 11 January 1972. Two further follow-up treatments were applied during the season 1972/73. For comparison of effectivity, paraquat was included in the tests. To prevent successive weed seed germination, simazine (2-chloro-4,6-bisethylamino-1,3,5-triazine) which has a long residual activity in the soil, was once applied in a tank-mix with glyphosate and once a fortnight after a glyphosate treatment.

It was found that both red nutgrass and common quick grass were effectively controlled by glyphosate. For red nutgrass two treatments during one season were necessary, the initial application rate being 2 kg active ingredient per hectare, followed up by 1 kg ai/ha twice a season. Common quick grass is more resistant than red nutgrass and an initial application rate of 3 kg ai/ha is required, followed up with 1 kg ai/ha at active regrowth, three times during one season, if necessary. It is very important for optimum uptake of the chemical, that the weeds are vigorously growing and have developed copious foliage. The trial results showed quite clearly that the first treatment should not be applied before the end of November, and the second in the latter part of the summer, when the weeds are actively translocating nutrients into tubers and rhizomes.

Young annual weeds were effectively controlled by both glyphosate at 1 kg ai/ha and paraquat at 0,5 and 1 kg ai/ha.

The tank-mix of the two herbicides glyphosate at 2 kg ai/ha and simazine at 3 kg ai/ha had no effect at all on any of the weeds, obviously due to incompatibility of the two chemicals. However, when glyphosate was applied first and simazine a fortnight later, the effect was as desired: glyphosate controlled the red nutgrass and simazine prevented seed germination of successive weeds, resulting in a soil surface free of plant growth for ten weeks.

The conclusion was that glyphosate can be used with success for the control of red nutgrass and common quick grass, provided follow-up treatments are continued for as long as necessary, otherwise total re-infestation by the weeds may result. No injury to the fruit trees and grape-vines was observed.

2. Evaluation of herbicides for use in strawberries

In the summer rainfall area the runner plants of strawberries are planted in February/March and the plants are then removed from the land in December. Thus the strawberry plantings are liable to two flushes of annual weeds, namely those of the late summer and winter which mainly belong to the Compositae, and those of spring and early summer which consist predominantly of various grasses. Some weeds like *Amaranthus hybridus* and *Portulaca oleracea* are found all the year round in the irrigation areas. By the end of the season strawberry plantings are often invaded by red nutgrass (*Cyperus rotundus*).

The object of the trials was to evaluate herbicides for use in strawberries under local climatic conditions and growing practices and it was found that only chlorthal (Dacthal) can be used with safety on strawberries under the climatic conditions of the summer rainfall area, although this herbicide will only partly control the weeds present.

(S)WP.180/5:

ORGANIC MATTER AND SOIL FERTILITY : DESTRUCTION OF
WEEDS IN MUNICIPAL COMPOST. 1974-1979
G.K. Schlieman

The presence of considerable numbers of a great variety of weeds in solid settlements-waste was detected at all seven municipal composting plants in the Western Cape. At the largest plant where 7 % m/m of the total waste consists of garden rubbish, 36 species were found frequently and 15 occasionally. Four of them are proclaimed, others are troublesome weeds. Weeds of all ages from immature to seed-bearing were encountered.

Despite the high weed incidence in the incoming waste an average of only 2,6 % of fresh compost samples from the four main composting plants contained weeds, while for mature compost the corresponding percentage was 0,7.

After seeds of barley and tomato proved suitable as tracers substituting 13 species of weeds, they were subjected to the usual composting process at the largest plant. Both tracers were rendered non-viable after 72 hours in the revolving stabiliser, or after a shorter retention time of 15 to 30 hours in the stabiliser when followed by five days in the first of a series of windrows. Under the conditions prevailing at a highly efficient composting plant, a heatsum (degrees centigrade x hours) of approximately 3 000 at the 50 °C level appears sufficient for complete destruction of weed seeds.

In vitro-experiments with 13 weeds and both tracers revealed a threshold heat-sum of 1 200 imbibed seed.

Dry seeds resist much higher heat-sums, but seed in contact with moist refuse either in the garbage can or in the stabiliser at the compost plant absorbs sufficient moisture within three days to become susceptible to high temperatures.

The process as employed at municipal composting plants ensures the destruction of the weeds under study.

ENTREPRENEUR DEVELOPMENT**EXTENSION****BEEF PRODUCTION**

- N-VI.17/2: **THE PROMOTION OF THE ECONOMIC INTENSIFICATION OF BEEF PRODUCTION IN THE SWARTBERG SECTION OF EAST GRIQUALAND IN BIOCLIMATIC GROUPS 4E AND 4F. 1974-1978**
A.R. Bischof

The aim of this project was to effect a 10 % improvement in the calving percentage and weaning mass of the beef herds of 28 farmers in the Swartberg locality of the Mt. Currie Soil Conservation District by planning the nutritional requirements of the stock, producing quality feed on the farm economically and improving breeding management.

However, a drastic change in the economic climate of the beef industry prevented achievement of the original objective. It was characterised by an accelerated rate of inflation, the rise in costs and consequently narrowing of the profit margin for the beef farmer. Systems which originally were profitable such as the sale of weaners or fattening of weaners, could no longer be recommended. In fact, after the first year the emphasis of the project had to be altered from intensification to the reduction of over-wintering cost to maintain a positive gross margin.

Programme activities completed included the filling in and processing of 22 questionnaires, soil classification on 9 farms, soil sampling on 18 farms (202 samples), fodder requirement and cropping plans designed for 17 farmers, assessment of winter feed position for 21 farmers, analysis of 47 feed samples, 61 *ad hoc* visits to beef farmers, establishment of a dryland Fescue demonstration block, demonstrations of legume sod seeding on 4 farms, evaluation of caustic soda treatments of maize, residue trials with LS33, forming of the Swartberg Postal record group with 6 farmers, 4 beef farmers' days attended by 184 farmers, beef workshop attended by 10 farmers, farmer tour attended by 8 farmers, two veld spraying demonstrations attended by 45 farmers, one legume seed pelleting demonstration attended by 8 farmers, one beef A.I. course attended by 7 farmers, six articles on beef production and four circulars on beef production.

The project was terminated after the 1977/78 year with 22 of 28 farmers having co-operated in the programme.

As an educational programme this project can be considered as highly successful.

AGRICULTURAL ENGINEERING SCIENCE**Mechanisation****DEHYDRATION OF APPLES**

- (A)L-MI.49/1: **INVESTIGATION OF EQUIPMENT FOR THE DEHYDRATION OF FRUIT AND ALLIED FARM PRODUCTS: EVALUATION OF THE CALIFORNIAN TYPE DEHYDRATION TUNNEL AT THE CITRUSDAL CO-OPERATIVE FRUIT DRYERS. 1974-1980**
G.W. Reddek

Large-scale tunnel dehydration has been practised in California since the 1940's. This type of drying has only recently caught on in South Africa and is at present being carried out on a relatively small scale. Co-operative drying has to be established before the use of the Californian type of tunnel is warranted in South Africa.

The Citrusdal drying tunnel is a counterflow Californian type dehydration tunnel designed to handle approximately 10 tons of fresh fruit a day.

The aim of the test was to determine the capacity of the tunnel and other design information, as well as aspects such as ease of operation and cleanliness.

Tests were done on apple chips with an initial moisture content of 84,78 %. It was found that it took from 14,58 to 16,25 hours to dry these apple rings to a moisture content of 13,42 % at a capacity of 5,43 tons of fresh fruit per day. The tunnel operated with only 8 stacks instead of the design capacity of 10 stacks. The burner delivered only $9,11 \times 10^5$ B/hr whereas it is rated as a 15×10^5 B/hr burner. This means that it operates at only 60 % efficiency. The drying time can be decreased by two hours if the moisture content of the dry fruit is brought down to the ideal of 18 % instead of 13,42 %.

Publication

Reddek, G.W., 1974. Test of a California type fruit dehydration tunnel at Citrusdal. Report No. 36/74 was sent to the Citrusdal Co-operative Fruit Dryers. No other publications are envisaged as the interest in co-operative drying is limited.

(A)L-MI.49/4: INVESTIGATION OF EQUIPMENT FOR THE DEHYDRATION OF FRUIT AND ALLIED FARM PRODUCTS: SIMULATION OF A COMMERCIAL DEHYDRATION TUNNEL. 1975-1980
G.W. Reddek and G.L. Wium

The relationship between the many parameters affecting the drying of a material in a dehydrator is discussed in the paper. A description is given of an experimental drying tunnel that was used by the Division of Agricultural Engineering at the Fruit and Fruit Technology Research Institute, Stellenbosch to simulate commercial drying tunnels. The behaviour of commercial apple-ring dehydrators was studied using this tunnel.

Publications

Du Preez, N.D., 1976. The simulation of a commercial counter flow Californian dehydration tunnel. Report No. 65/76.

Reddek, G.W., 1977. Laboratory simulation of a commercial dehydration tunnel. *Agric. Engng S. Afr.* 11, 1.

SUPPORTING SERVICES

BOTANY

Ecology

SURVEYS

- (A)P-Pr.24: PLANT ECOLOGICAL SURVEY OF THE UPPER ORANGE RIVER VALLEY. 1969-1980
M.J.A. Werger

The Upper Orange River Valley is about 656 km long, of varying width and measuring just over 3 000 km² in surface area. It has a summer rainfall climate, with maximum precipitation during March and the minimum during June or July. Precipitation is mostly in the form of thunderstorms. Frost and infrequent snow can occur over the entire area, both occurring more often in the eastern than in the western part. There is a major, complex gradient following the river course from east to west, with decreasing average annual relative humidity and precipitation, which gradient changes from over 600 mm in the east to less than 300 mm in the west; an increase in temperature also occurs, particularly in the average daily maxima of the warmest month, in evaporation and in mean saturation deficit. This results in a climatic gradient from relatively humid, temperate tropical in the east, through drier steppe to a dry sub-desert climate in the west. Due to topographical differences, which are more prominent in the east than in the west, there are considerable differences in meso- and microclimates.

From east to west, the river flows over successively older strata of the Karoo System: first the Stormberg Series, then the Beaufort and Ecca Series, and finally the Dwyka Series that is locally interrupted by the Precambrian Ventersdorp lavas. The succession is frequently interrupted by dolerite intrusions. Tertiary to recent aeolian Kalahari sand and calcrete accumulations occur in the westernmost part. Alluvial deposits occur locally all along the river course. Geomorphologically the landscape changes from rather dissected in the west to a flat monotonous landscape with isolated inselbergs and scattered pans in the west.

Soils vary from Highveld Prairie soils in the east, through Solonchic soils to sandy and calcareous desert soils in the west. Shallow lithosols are common throughout.

Land use is mainly mixed farming in the east and extensive stock farming in the west.

From east to west the vegetation grades from grassland to open dwarf shrub and grass and to open dwarf shrub steppe. Slopes are usually covered by an open shrubby vegetation, while on Kalahari sand in the west open tree savanna occurs locally. Riverine forest and woodland fringes the river over virtually the entire study area.

Phytographically the major chorological boundary between the Sudano-Zambezian Region and the Karoo-Namib Region crosses the valley just downstream of Petrusville, coinciding with the boundary between dissected and flat countryside. In the easternmost part of the area the Afro-montane element is well represented, but the Cape element is virtually absent in the entire Upper Orange River valley.

The vegetation was studied according to the Zurich-Montpellier approach. A description of the plant communities, their structure, habitat, distribution within the study area and syntaxonomical rank is given. All syntaxa are newly described. Riverine forest and woodland on the levees of the Upper Orange River is described in two associations, the Rhoo-Diospyretum and the Zizipho-Acacietaum karroo, belonging to the same Diospyrion lycioidis alliance. The Rhoo-Diospyretum is divided into two subassociations, the celtidetosum and the acacietaum karroo. An *Acacia karroo* variant of the celtidetosum is recognised. These syntaxa occur in a geographical sequence, probably due to the climate gradient in the area. Some riverine communities of minor extent and importance are also briefly described. Three communities are distinguished in the grassland vegetation of the eastern part of the study area, but are not ranked syntaxonomically.

One association, the Hermannio coccocarpae-Nestleretum confertae, with three subassociations, the aptosimetosum marlothii, the eragrostietosum curvale and the oropetietosum, as well as a variant with *Eragrostis lehmannia*, are described for the dwarf shrub vegetation of the plains of the False Upper Karoo. The differences in habitat for the subassociations and variant are indicated. A provisional description is given of the alliance Pentzio-Chrysocomion, to which the Hermannio-coccocarpae-Nestleretum association belongs.

The shrubby communities of the slopes in the eastern grassland area and the False Upper Karoo all belong to the class *Rhoetea erosae* in which two orders have been recognised. The *Grewio-Rhoetalia erosae* on mesic sites mainly to the east of Aliwal North, comprises three associations: the *Rhamno-Rhoetum* on south facing slopes, the *Rho-o-Aloetum ferocis* on north facing slopes, and the *Blepharido-Rhoetum* on mesic sites near Aliwal North. The first two associations are combined into the alliance *Indigofero spinescentis-Rhoion erosae*. Afro-montane and Afro-montane-Cape elements are well represented in the *Grewio-Rhoetalia erosae*, particularly in the *Rhamno-Rhoetum*. The *Rhoetalia ciliato-erosae* that includes most of the shrubby communities between Aliwal North and Petrusville has five associations: (i) the *Osteospermetum leptolobi* on gently sloping terrain with shallow soils on sandstones and mudstones, with the subassociations *typicum* and *aptosimetosum marlothii*; (ii) the *Stachyo-Rhoetum*, mainly on north facing dolerite slopes, with the subassociations *polygaetosum* and *hermannietosum candidissimae* and, near Petrusville, a variant with *Salvia namaensis*; (iii) the *Nanantho vittati-Rhoetum*, mainly on north facing sandstone slopes near Bethulie; (iv) the *Maytene polyacanthae-Oleetum africanae*, largely confined to steep south facing dolerite slopes, with the subassociations *typicum* and *chamareetosum*; and (v) the *Setario lindenbergi-anae-Buddleietum salignae* on dolerite slopes just below the summits in the area around Petrusville. The first three associations are combined into the alliance *Hibisco-marlothiani-Rhoion erosae*. The western boundary of the *Rhoetea erosae* coincides in the study area with the boundary between the Sudano-Zambesian and Karoo-Namib Regions.

Shrub and dwarf shrub communities on rocky soils downstream of Petrusville belong largely to the class *Pentzietea incanae* comprising five associations: (i) the *Zizipho-Rhigoetum obovati*, mainly on dolerite slopes between Skurwekop and Hopetown, with the subassociations *cheilanthesetosum ecklonianae* and *inops*; (ii) the *Melhanio rehmannii-Hermannietum spinosae* on andesitic lava slopes downstream of Hopetown; (iii) the *Monechmatetum incani* on alkaline sites where some concentration of run-off occurs, with the subassociations *typicum* and *pentzietosum calcareae*; (iv) the *Nestlero humilis-Pteronietum sordidae* on calcrete-rich substrata downstream of Orania, with the subassociations *typicum* and *stipagrostietosum ciliateae*; and (v) the *Eriocephalo-Eberlanzietum* on nearly level, slightly acid, loamy sands between Skurwekop and Hopetown. The *Zizipho-Rhigozetum obovati* and the *Melhanio rehmannii-Hermannietum spinosae* are combined into the alliance *Enneapogono scabri Rhigozion obovati*, and the *Monechmatetum incani* and the *Nestlero humilis-Pteronietum sordidae* into the *Zygophyllion gilfillani*. Both alliances are combined into the order *Pentzio incanae-Rhigozetalia trichotomi*.

Two associations occur in the study area on Kalahari sand: (i) the *Enneapogono brachystachyi-Stipagrostietum* on slightly loamy sand, and (ii) the *Pentzio calcareae-Stipagrostietum* on pure Kalahari sand overlying calcrete. The latter association includes the subassociations *typicum* and *acacietesum giraffae*. Both associations, together with some associations described from the southern Kalahari, can be combined into the alliance *Stipagrostion* which is described provisionally.

Some communities of minor extent in the study area are briefly described without attempting to rank them syntaxonically.

An integrated outline of the ecological and syntaxonomical gradient emphasises the climatic changes and the floristic and structural features of the communities. Based on soil moisture regime, three parallel series of communities from mesic to xeric are represented. The expression of habitat conditions in species composition and community structure is discussed. Finally, the relation between the impact of mismanagement on the vegetation and diversity in landscape and vegetation is briefly discussed. A check list of species occurring in the relevés is appended as well as an index to genera and families.

(A)P-Pr.28: EVALUATION OF DIFFERENT TYPES OF AERIAL PHOTOGRAPHS
FOR MAPPING GRASS AND DWARF SCRUB VEGETATION
IN THE EASTERN ORANGE FREE STATE. 1971-1980
N.G. Jarman

This research was undertaken to assess the potential of colour and monochrome prints, and infra-red transparencies, at a scale of 1:12 000 for interpretation and mapping at a semi-detailed level, of grass and dwarf shrub communities in the Eastern Orange Free State. Literature on use and different types of air photos was reviewed to establish a *modus operandi*. It was evident that accurate interpretation had to be based on extensive ground control.

The initial problem was to establish that discrete photo-units, on the ground recognisable on the aerial photographs as homogeneous texture pattern and hue (tone in monochrome), represented a homogeneous vegetation unit.

Vegetation homogeneity was evaluated in terms of species dominance based on cover. Grass species with a basal cover of 10 % or more of the total basal cover were considered dominant as were dwarf shrub

species with an aerial cover of 3% or more. The point method of Tidmarsh & Havenga using the apparatus of von Broembsen was used to measure both basal and aerial cover.

Photo-unit boundaries were marked on the air photos and within each corresponding area on the ground two separate surveys were made to estimate dominance. These two areas were compared on the basis of dominant species and found not to be significantly different at a 0.01% level. Homogeneous images on the air photos did therefore represent homogeneous plant communities.

The dominance data showed photo-units with similar hue and texture to have similar vegetation; photo-units with different hue and texture had different dominant species.

From ground information obtained in initial investigations a pattern of dominant species distribution in relation to hue, texture, position on the landscape and biotic factors on the photo image emerged. Extrapolation of these data followed, with attempts to predict which dominant species were present in photo-units. To test the accuracy of these predictions or interpretations, further cover surveys were carried out in corresponding positions on the ground.

To evaluate the accuracy of species interpretation, the following measures were used, where "A" is the species predicted as present and "B" represents the actual field situation.

$$\text{Percentage correct interpretation} = \frac{\text{Number of A's agreeing with B's}}{\text{Total B's}} \times 100$$

$$\text{Percentage commission} = \frac{\text{Number of A's not agreeing with B's}}{\text{Total A's}} \times 100$$

$$\text{Percent omission} = \frac{\text{Number of species excluded in A but present in B}}{\text{Total B's}} \times 100$$

Dominant-species interpretation accuracy increased from 57 to 83% with experience.

A vegetation classification based on total floristic and dominance species and correlating with landscape was created. From this a practical mapping classification was derived.

Using this classification and annotated aerial photographs, maps were drawn using a radial line plotter. When individual photo-units were grouped within the framework of the broader vegetation classification, a photo-interpretation accuracy of 98% was achieved.

Using these techniques with the different photographic types, interpretation accuracy of colour prints was compared with that of monochrome prints and infra-red transparencies. In this study colour prints were found to be superior for overall interpretation; infra-red transparencies had better resolution, but the full range of hues was not realised because of indifferent processing.

(A)P-Pr.36: PHYTOSOCIOLOGICAL STUDY OF THE WESTERN TRANSVAAL
SOURISH MIXED BUSHVELD WITH SPECIAL REFERENCE
TO THE ECOLOGY AND PLANNING OF THE LANDSCAPE.
1976-1980
F. van der Meulen

The syntaxonomy and synecology of the vegetation of the western Transvaal Bushveld, South Africa, are described. The study area comprises about 25 000 km² of savanna-woodland, with the towns Pretoria, Mafeking, Gaborone and Warmbad at the four corners.

The area is part of the interior plateau of South Africa with a climate classification by Köppen as a hot, dry steppe climate with mean annual temperature over 18 °C. Most soils are ferrallitic, but vertic soils also occur. Three broad physiographic regions are recognised: (i) warm and dry lowlands of the Transvaal Bushveld Basin, (ii) cooler and moister uplands, mainly to the south, surrounding this Basin, and (iii) dry plateau area near Mafeking with a continental type of climate.

The Bushveld Basin is underlain by granites, norites and gabbros, with some associated intrusive igneous rock such as diabase, felsite and andesite. Norites and gabbros have weathered to black vertisols, whereas the granitic rocks have formed gravelly sands, sometimes with pseudo-grey features resulting from impeded soil drainage. However, at several places sediments are found with a variety of associated soils. The uplands are composed of alternating beds of shale and quartzite, often appearing as parallel series of ridges with north-facing dip slopes of quartzite and steeper, south-facing slopes of shales. Diabase sills and andesitic lavas crop out extensively. Leached sands are commonly derived from the quartzites. Elsewhere,

less leached, clayey soils occur. Alluvial and colluvial soils are found in bottomlands. Bedrock and lithosols cover about 60 % of the uplands. The Mafeking plateau is comprised of dolomites and lavas with dark to red alkaline sands. Rock outcrop and shallow stony soils are common.

The ecological importance of fire in the survey area is illustrated with data from LANDSAT imagery. In 1972 and 1975 widespread burning appeared in mid-winter, from as early as July, into August and September. Extensive cattle farming is the most common form of land use.

The Western Transvaal belongs floristically to the Zambezian Domain of the Sudano-Zambezian Region. The flora of the Bushveld Basin indicate affinity with the Southern Kalahari and the eastern part of central South-West Africa. The Mafeking plateau shows affinities with the Karoo-Namib Region. The afro-montane element is present in moist, sheltered kloofs of upland sites. The Limpopo Valley, along the northern margin of the study area, provides a possible east-west migration route for species of warm, dry savanna types. The Waterberg to the north, and the Magaliesberg to the south of the study area appear to provide a corridor for the westward migration of montane forest species, that occur down the great eastern escarpment of the sub-continent.

Dansereau's system of structure-diagrams was applied for the first time in South Africa to depict the structure of plant communities. The use of structure in the Braun Blanquet phytosociological classification is briefly discussed.

Twenty-two associations are described in terms of their floristic composition, structure and environment and against the relevant literature. A "type-relevé" is selected for every association. The communities are grouped in three broad classes, roughly corresponding to the three physiographic regions. A fourth class comprises azonal riparian forest vegetation.

Microphyllous, thorny vegetation of the warmer, drier Bushveld Basin is described as the *Acacia tortilis*-*Panicum maximum* Woodland Order with floristic affinity to the southern Kalahari. This woodland is the most disturbed of all types, particularly as regards structure. Two alliances and six associations are recognized. *Acacia tortilis*-*Aristida bipartita* Woodland Association occurs on extensive flats with black, vertic clays. Thicket-like vegetation, described in the *Acacia tortilis*-*Carissa bispinosa* Woodland Alliance, occurs on intrusive sheets of rock and low termite mounds. Termite mounds provide relatively mesic woodland habitats, possibly because of a more favourable local moisture content of the soils. Some species typical of mesic upland communities, extend their range into more xeric lowlands by occurring on termite mounds. Other vegetation in the Basin is described in five associations of the *Acacia mellifera*-*Schmidtia pappophoroides* Woodland Alliance:

(i) *Acacia erubescens* Woodland on ferro-gabbro outcrops, (ii) *Acacia tortilis* Woodland on various kinds of heavier soils, (iii) *Spirostachys africana*-*Sporobolus ioclados* Woodland in often somewhat brackish depressions on granite, (iv) *Acacia luederitzii*-*Boscia albitrunca* Woodland on Karoo beds and aeolian sands, and (v) *Acacia erioloba*-*Acacia fleckii* Woodland on the remaining areas of deep red sands. The latter association grades into the *Acacia tortilis* Association as soils become more clayey. A sixth community, the *Acacia hereroensis* Variant is represented by scattered stands of disturbed thorny vegetation on the Mafeking plateau.

Mesophyllous vegetation of cooler, moister uplands is described in the *Combretum molle*-*Diheteropogon amplexans* Woodland Order, with floristic affinities to the miombo woodlands further north. Except for bottomlands and lower slopes, there is less disturbance by man and livestock. Within this Order, the overriding habitat factors of aspect and geology distinguish the *Burkea africana*-*Perotis patens* Woodland Alliance of warm, rocky slopes and deep sands from the *Faurea saligna*-*Rhynchelytrum setifolium* Woodland Alliance of cool, rocky slopes and summit areas. The former consists of three associations: (i) *Croton gratissimus*-*Canthium gilfillanii* Woodland on rocky sites, (ii) *Ochna pulchra*-*Terminalia sericea* Woodland on deeper, leached sands, and (iii) *Combretum apiculatum*-*Eragrostis nindensis* Woodland on granitic sands in the Bushveld Basin. On granitic soils that often have impeded drainage because of an impervious lateritic ironpan, the vegetation consists of macro-mosaic of sourish grassland with trees clumped on better-drained soils of termite mounds. The first two associations mentioned often occur along an ecological gradient ranging from pure rock to deep, infertile sands. Within the sandveld association another ecological gradient often extends upwards from deep soils on footslopes to shallow rocky soils near summit areas. The *Ochna pulchra*-*Terminalia sericea* Association also occurs locally on deep sands in the Bushveld Basin. Isolated rocky koppies in the Basin carry a slightly more xeric phase of mesophyllous upland communities of the *Croton gratissimus*-*Setaria lindenbergiana* Woodland Association and the *Combretum apiculatum* Woodland Association.

The *Faurea saligna*-*Rhynchelytrum setifolium* Woodland Alliance has four associations: *Acacia caffra*-*Bewisia biflora* Woodland and *Protea caffra*-*Eragrostis racemosa* Woodland occur on cool, moist, steeper rocky slopes and on summit areas. The latter represents a marginal type of bushveld, bordering the frosty Highveld plateau. Steep rock faces support low shrubland of the *Clutia pulchella*-*Brachymeris*

athanasioides Association on cool, exposed sites and of the *Ficus ingens-Plectranthus madagascariensis* Association in warmer environments.

The third broad class comprises transitional Woodland types with elements of both microphyllous lowland and mesophyllous upland vegetation. Four associations are described. *Acacia tortilis-Tragus racemosus* Woodland occurs on clayey, eutrophic, often colluvial soils in bottomlands and *Rhus lancea-Brachiaria serrata* Woodland is found on clayey, eutrophic lithosols of lower slopes. Overgrazing and donga-erosion are often associated with these two communities. Xeric vegetation of alkaline sandy lithosols on the Mafeking plateau is described in the two associations of *Tarchonanthus camphoratus-Fingerhuthia africana* Alliance, the *Diospyros austro-africanum-Eragrostis echinochloidea* Woodland on Ventersdorp Lavas and the *Olea africana-Stipagrostis uniplumis* Woodland on the Dolomite Formation. The floristic composition and the ecology of this vegetation indicates relationship with more arid vegetation further west (Karoo-Namib Region). Areas not studied in detail are provisionally grouped with the transitional woodlands and no names were assigned to plant communities.

Altitude, as it affects rainfall and temperature, is regarded as the overriding habitat factor determining the distribution of the communities. Other important factors are aspect, geology, rockiness and soil texture, as expressed by degree of leaching. The communities are arranged along a local mesic-xeric gradient and an altitudinal gradient, based on expected soil moisture conditions. Greatest species diversity is found in the transitional vegetation types. In mesic upland bushveld, sclerophylly appears to be an adaptation to changing climatic conditions rather than to a loss of water through the leaves.

(A)P-Pr.38/1: VEGETATION SURVEY OF THE ZULULAND COASTAL DUNES:
THE AREA BETWEEN RICHARDS BAY AND THE MFOLOZI
RIVER.
P.J. Weisser

The survey was requested following the granting of prospecting rights on the Zululand coast, where mining for zircon, ilmenite and rutile entails the complete removal of vegetation, followed by re-vegetation of the dunes after mining activities have ceased. The main objectives of the study were: to obtain factual information on the dune vegetation between Richards Bay and the Mfolozi River; to provide a vegetation map as a basis for land-use planning; to discover and delimit areas of high botanical value; and to establish conservation priorities in this area.

The study area lies between latitudes 28°47' and 28°24' South and longitudes 32°06' and 32°26' East and includes the dune barrier, the adjacent afforestation, and fields and swamps along the Zululand coast between Richards Bay and the Mfolozi River Mouth. The area is about 60 km long, and has a varying width up to 3,1 km, and a surface area of 8 300 ha. In the southern part the dunes are mostly gently undulating with secondary vegetation, whereas the dunes in the northern Mapelane area are steep and high (up to 182 m) with dense forest. Whilst in most of the study area the seaward side of the dune barrier is normally covered with a dense, stunted, woody vegetation, the landward side presents secondary plant growth and afforestation.

The study area is part of the Zululand Coastal Plain, with one to four main dune ridges running parallel to the coastline. The dune soils are sandy, recent sands being whitish, whilst older sands are reddish to brownish.

The climate is warm to hot and humid. Mean annual rainfall at Cape St. Lucia is 1 292 mm. The predominant winds blow from the north-east and south-west. The north-easterly winds are most important in the formation and advancement of drift sand in the study area north of Cape St. Lucia, while south of this point the south-westerly winds have a greater effect. The reason for this lies in the change of direction of the coastline from N-S to NE-SW.

The project was initiated with a reconnaissance and plants were collected over the study area. Detailed studies using plot and transect techniques were done in areas of specific interest. Mapping was based on air-photo interpretation and ground control. The suitability of air-photo interpretation for monitoring dune vegetation was tested by comparing vegetation maps obtained from air-photos of 1937 with those of 1974.

Twenty-four mapping units were distinguished. Most extensive were secondary *Acacia karroo* Woodland and Secondary Dune Scrub, each of which occupied 1 603 ha, followed by Eucalypt and Pine Plantations (1 376 ha) and Primary Coastal Dune Medium Forest (1 352 ha). Conservation priority ratings were superimposed on the six vegetation maps. Primary woody dune communities with high priority for conservation covered 24% of the area (2 016 ha), while 61% (5 098 ha) was occupied by secondary communities of low conservation priority. Minor communities of varied conservation importance, human dwellings, lakes, ponds, rivers and bare sand surfaces occupied the remaining area.

Most of the northern part of the study area rates as first priority for conservation and should not be mined. There is no major objection to mining the area situated about 1 km south of the lighthouse road to Richards Bay, with the exception of some areas that have been specifically indicated on the maps as having first priority for conservation.

Owing to their outstanding vegetation, it is therefore proposed that the current conservation status of the following areas be upgraded: (1) the Mapelane area, (2) the Dawson's Rock-Nhlabane Lagoon area, (3) the Coastal Reserve, (4) the Mtindala Pan, (5) the Richards Bay Peninsula with Menywa and Sontwayo Pans area and (6) the Magongolo Pan.

In the proposed Coastal Reserve some valleys ("arcuate scars") with undisturbed vegetation were discovered on the foredunes. The valleys are caused by springs which have eroded the steep frontal dune to form a valley, often with an oval swamp in the centre and steep, densely vegetated flanks. They are still in an original state and represent relics of the otherwise mostly destroyed vegetation between Richards Bay and Nhlabane Lagoon and should therefore be protected.

Air-photo comparison (1937-1974) shows the dune vegetation to be very dynamic. About 55 % of the study area changed as regards mapping unit during that period. The changes are due mainly to afforestation on the one hand, and secondary succession on the other, where protection against fire, wood cutting, grazing and shifting cultivation by the Department of Forestry has led to the recovery of the vegetation over extensive areas. Clearly shown is the fast recovery capacity of this type of vegetation in the Zululand coastal environment when under conservative management.

OK-Do.79/6:

BOTANICAL SURVEY OF THE UPPER ORANGE RIVER
CATCHMENT AREA: SUB-CATCHMENT AREAS
STORMBERGSPRUIT, BAMBOES, WONDERBOOM AND
UPPER-STORMBERG.
1974-1979
J.J. van Pletzen

This investigation forms part of the general survey of the Upper Orange River catchment area. This report deals with the vegetation in the Molteno district. By means of veld reconnaissance, observations, botanical surveys and with the aid of aerial photographs, the vegetation has been classified, described and mapped.

PLANT PROTECTION

Entomology/Zoology

LOCUST RESEARCH

(A)I-Pr.45:

THE LOCUSTS AND GRASSHOPPERS OF SOUTH AFRICA.
1958-1980
H.D. Brown

Representatives of all eight families of Acridoidea found in Africa occur within the Southern African subregion. Of these, Pneumoridae, Lathiceridae, Charilaidae and Lentulidae can be regarded as indigenous and peculiar to the subregion. In the Pneumoridae, for instance, of the 16 species at present recognised all but two are confined to Southern Africa. The two exceptions, *Physophorina livingstoni* and *P. miranda*, are forest species which range up the coast to East Africa. All five species of Lathiceridae are confined to South-West Africa, though one species also occurs in the Cape Province. Five of the six species of Charilaidae occur in South and South-West Africa while of the 22 genera and 76 species belonging to the family Lentulidae, 19 genera and 45 species are limited to Southern Africa. The subfamilies

Echinotropinae of Pamphagidae and Lithidiinae of Acrididae are also purely Southern African in their distribution. Euryphyminae and Portheninae can also be considered as predominantly Southern African.

The bulk of the endemic species is distributed throughout the Southern and South-western Cape, Karoo, Namaqualand and the more arid parts of South West Africa. Representatives of this endemic element appear to have radiated into the adjoining territories. Species of *Lentula*, *Sygrus*, *Eremidium*, *Malawia*, *Paralentula*, *Basutacris* and *Swaziacris*, for example, are distributed along the forests and mountains of the eastern Escarpment, Lesotho, Transvaal, Natal, Swaziland, Zimbabwe-Rhodesia, Mocambique and up to Malawi. On the other hand, a number of species of *Euryphymus*, *Pachyphymus*, *Anabibia*, *Shelfordites*, *Uvarovidium* and *Lithidiopsis*, for example, are distributed up the western part of the subregion and into Angola.

The majority of species found in Southern Africa, predominantly Acrididae, represent an incursive tropical element. The grasshopper fauna of Southern Africa, therefore, represent a mixture of endemic southern forms on the one hand, and tropical forms derived from the Sudanian subregion on the other, with the latter forms predominating. The tropical forms are generally associated with savanna and savanna-woodland habitats, whereas the majority of endemic forms are associated with Cape maccia and steppe vegetation.

NEMATOLOGY

- (A)I-Pr.115/2: STUDY OF THE ECONOMIC IMPORTANCE, BIOLOGY, ECOLOGY
AND CONTROL OF *HETERODERA SCHACHTII*
(THE SUGAR BEET NEMATODE) IN SOUTH
AFRICA. 1971-1975
V.H. Meaton

A survey in the Witwatersrand and Pretoria areas found the nematode to be present in all places visited, apparently without causing damage to crops like beetroot, cabbage and lettuce. In the Les Marais area (Pretoria), where collections of material were made for use in experiments, the viability of the cysts was found to be very low. Only 50 larvae/cysts were found.

It was found that if cysts were allowed to dry during storage, this caused the larvae to die. The cysts were kept damp by storing them on damp filter paper in petri dishes. Later it was found that storing the cysts in small gauze bags in damp soil was more effective. Fungal infections were a constant problem which could not be solved.

Various plants were tested for suitability as hosts for *H. schachtii*. Tomato was found to be a poor host whilst beetroot, cabbage and cauliflower were found to be good hosts for the nematode.

An experiment was laid out to establish the efficacy of different root exudates and hatching stimulants at different concentrations. Tomato-root exudate, beetroot exudate, picric acid and tap water were used at the concentration of 1:1, 1:4 and 1:16. Tomato-root exudate proved to be a poor hatching stimulant whilst picric acid gave the best results with beetroot exudate and tap water having a moderate effect.

The life-cycle of *H. schachtii* was found to take 43 days. This is in contrast to the 28 days found by Shepherd, Stone and others. No definite reason could be given for this difference.

COCHINEAL INSECT

- (A)I-Pr.146: STUDIES ON DISPERSAL OF THE IMMATURE STAGES
OF THE COCHINEAL INSECT, *DACTYLOPIUS AUSTRINUS*
DE LOTTO (HOMOPTERA: DACTYLOPIIDAE).
1977-1979
B.H. Gunn

A distinct sexual dimorphism was found in the pattern and development of the wax filaments on the dorsal surface of the first-instar nymphs (crawlers). Female crawlers had long filaments on the head, thorax and abdomen while males had long filaments only on the abdomen. The numerous wax filaments on the female crawler reduced her terminal velocity in air currents.

Male crawlers settled in close proximity to the parent scale, but female crawlers moved away and those about 60 hours old, aggregated on the spines of the terminal cladodes of jointed cactus. This behavioural pattern together with the long wax filaments increased the chances of female crawler dispersal. These findings were confirmed in field trials.

Crawlers were very hardy in comparison with other coccoid species, the non-feeding crawler being able to survive for up to 252 hours at 25°C and 50% R.H. At a temperature of 40°C, the survival time was reduced to 90 hours. Non-parthenogenetic females reared on loose cladodes produced fewer crawlers than those reared on whole plants.

Environment-room studies on the "drop-off" of crawlers from cladodes indicated that light and temperature determined the number of motile crawlers available for dispersal. Host plant height was also important in crawler dispersal and was used to evaluate a system of elevated towers for the spread of cochineal in the field. Results indicated that wind dispersal of crawlers from cultures of *D. austrinus* placed on towers was more effective than hand augmentation and could offer an alternative to the costly and inefficient herbicidal control programme.

STABLE FLY

B. Sutherland: BIONOMICS OF THE STABLE FLY, *STOMOXYS CALCITRANS*
LINNAEUS (DIPTERA: MUSCIDAE).
(Research Project OP-ENT. 27)
Ph.D.: University of the Witwatersrand. 1979
Promotor: Prof. H.E.H. Paterson

This study dealt with the effects of nutrition and different constant temperatures on the various developmental stages of *Stomoxys calcitrans*. These effects were measured on the adult stage, by using parameters such as longevity and reproduction. The results were then combined and expressed in terms of a single parameter, reproductive potential. Physiological age determination in adult females was studied in detail, the method normally used modified and applied with success in some of the studies on the biology of adult flies.

Nutrition had a pronounced influence on the life-history of the stable fly. When fed on blood from herbivores (cattle, sheep, goat, horse and donkey), the adults laid more eggs than when fed on blood from an omnivore (pig). Blood from a carnivore (dog) was even less suitable than that from the omnivore and when the flies were fed on chicken blood, no eggs were laid.

Four plant materials, standard larval breeding medium, the dung of seven species of domestic animals and three mixtures of some of these materials were evaluated as breeding media for *S. calcitrans* larvae.

S. calcitrans could not breed in pure chicken dung nor in either of the two types of sawdust tested, but *Pinus* spp. sawdust mixed with chicken dung was an excellent breeding medium. Of the other media tested, *Pennisetum* spp. clippings were least favourable for the development of larvae. None of the media tested had an effect on the sex ratio of the adults that were cultured or on the viability of their eggs.

Temperature affected various life processes of *S. calcitrans*. The eggs, larvae and pupae seemed to tolerate constant ambient temperatures of 15° to 30°C, although at 15°C pupal mortality increased linearly with increasing periods of exposure to this temperature.

Studies on the temperature preferences of the larval and adult stages strongly suggested that all the developmental stages of the stable fly occur in the same general habitat. The thermal histories of the experimental flies had no effect on their later reactions towards temperature and this emphasised that the behaviour of this species may be of considerable importance in its survival in a eurythermal habitat. Laboratory tests determined that larval temperature preferences corresponded remarkably well with those of these developmental stages in their natural breeding sites. These natural breeding sites, however, had varying interior temperatures which were greatly influenced by the prevailing climatological conditions. The adults' temperature preferences coincided with those temperatures that were most suitable for their longevity and reproduction. The frons width of the adult male was also found to be influenced by the culturing temperature at which the fully-fed 3rd instar larvae were raised. This phenomenon suggests that this character is under polygenic control in this species.

This study was not aimed at assessing the evolution of *S. calcitrans*, but the results obtained suggest that this species fits the 'r-strategist model', and this may serve as supporting evidence in relevant studies to verify this postulation.

LUCERNE SPRINGTAIL/BLACK SANDMITE

W-Sb.31/1:

CONTROL OF THE LUCERNE SPRINGTAIL (*SMINTHURUS VIRIDIS*) AND THE BLACK SANDMITE (*HALOTYDEUS DESTRUCTOR*) IN THE WINTER RAINFALL REGION. 1980
J. Lombard and S.S. Walters

Introduction

The basic purpose of this project is an investigation into possible techniques for the control of the Lucerne Springtail, *Sminthurus viridis* (Collembola: Sminthuridae) and the Black Sandmite, *Halotydeus destructor* (Acari: Eupodidae). These pests are to date considered to be the two most important pests of improved legume pastures in the Winter Rainfall Region.

S. viridis, a foreign pest, is suspected to have entered the country in consignments of clover seeds, imported from Western Australia during the period 1939-1941. *H. destructor* is indigenous in all countries with a mediterranean climate.

There is a close resemblance in the biology and seasonal appearance of these two pests. Both bridge the dry, hot summer months as dormant eggs. These eggs commence hatching after the first winter rains and the process might last until mid-winter. Pest numbers reach a peak during the period July-September, and then disappear with the onset of hot and dry summer conditions during October-November.

Legume pastures grown during the winter are as such then exposed to damage by these pests right through the active growing season. The feeding action of *H. destructor* is one of scraping and sucking. During a heavy infestation this could result in disfigured leaves and stunted plants. *S. viridis* removes large areas of the leaf epidermis, and in the case of severe attacks only the veins of the leaves will remain.

Pastures are especially vulnerable to attacks by these pests during the seedling stage. Their feeding activities cause the seedlings to die, resulting in poor stands and yields. The high costs involved in establishing pastures demand a good stand and even more so in the case of perennial legume pastures.

Control

The vulnerability of legume pastures in the seedling stage demands protection against *S. viridis* and *H. destructor* during this stage.

Chemical control was seen as a useful short term method in this regard. However, the costs involved in chemical control, relative to the economic potential of legume pastures plus problems associated with the application of insecticides, also led to an investigation into the possibility of longterm control by means of biological agents.

Chemical control

Chemicals for the control of the Lucerne Springtail and Black Sandmite in young pastures could be applied by means of aerial or surface spraying, or by seed treatment.

Choice of technique of application

Aerial spraying has the advantage that large areas can be sprayed in a relatively short space of time. The costs involved in this technique, relative to the economic potential of improved pastures, are, however, difficult to justify. Surface spraying by a tractor drawn spraying machine, on the other hand, carries a problem of mechanically damaging the seedlings as well as the prepared seedbed.

These restrictions led to the development of the idea of seedling protection against *S. viridis* and *H. destructor* by treating the seed with a suitable systemic insecticide. Seed treatment, as compared to other forms of insecticidal application, offers the following advantages:

- It is relatively cheap.
- It needs to be done only once and seeds can be treated in advance.
- Dependent on the characteristics of the insecticide, it offers protection to the seedlings over the entire vulnerable period.

A disadvantage associated with this technique is the fact that it can only be practised during the initial establishment of legumes. As such it is ideal for perennial pastures like lucerne, and pastures which are established annually, e.g. lupins. In the case of the self-sowing cultivars, e.g. medics and subterranean clovers, spraying should be introduced from the second year onwards.

Choice of insecticides

The two techniques, viz. spraying and seed treatment, necessitated the evaluation of two types of insecticides.

Spraying

Different contact insecticides were tested in the laboratory and in the field as sprays for the control of the Lucerne Springtail and Black Sandmite. Good results were obtained with:

For control of Lucerne Springtail

dicrotophos
azinphos-ethyl
mercaptopthion
endosulfan

For control of Black Sandmite

dioxathion
azinphos-ethyl
mercaptopthion
DDT
endosulfan
carbaryl

TABLE 1 - Field evaluation of the efficacy of insecticidal sprays against *Sminthurus viridis*, as indicated by the results of population surveys carried out 16 days after treatment

Treatment	Number of Springtails	% Control
dicrotophos (62g a.i./ha)	0	100,0
azinphos-ethyl (38,5g a.i./ha)	47	97,8
mercaptopthion (62g a.i./ha)	15	99,3
endosulfan (62g a.i./ha)	26	98,8
control	2 156	

TABLE 2 - Field evaluation of the efficacy of insecticidal sprays against *Halotydeus destructor*, as indicated by the results of population surveys carried out 16 days after treatment

Treatment	Number of Mites	% Control
dioxathion	475	74,9
azinphos-ethyl	42	97,8
mercaptopthion	212	88,8
DDT	89	95,3
endosulfan	4	99,8
carbaryl	409	78,4
control	1 893	

Of these insecticides azinphos-ethyl (for the control of the Black Sandmite and Lucerne Springtail) and DDT (for the control of the Black Sandmite) were initially recommended. The withdrawal of DDT from the market and the high relative toxicity of azinphos-ethyl, however, led to the registration of insecticides like mercaptopthion for control of the Lucerne Springtail and omethoat for control of both Lucerne Springtail and Black Sandmite.

Seed treatment

For seed treatment to be effective, it is necessary for the insecticide used to penetrate the seed-skin and be absorbed through the germ plant into the seedling, and be biologically active against *S. viridis* and *H. destructor* for the entire vulnerable period of the seedling.

Systemic insecticides tested in the laboratory and in the field for this purpose include:

dimethoate
fenthion
dicrotophos
disulfoton
phorate

TABLE 3 - Laboratory evaluation of the efficacy of systemic insecticides applied as a seed treatment against *S. viridis* and *H. destructor* on lucerne, as reflected in the percentage mortality, 39 days after plants emerged

Treatment	% Mortality	
	<i>S. viridis</i>	<i>H. destructor</i>
dimethoate	74,5	75,5
fenthion	25,5	38,0
dicrotophos	27,0	37,0
disulfoton	66,5	74,0
phorate	96,0	99,5
control	10,1	11,5

(All insecticides applied at a dosage rate of 112 g active material per 45 kg seed)

From Table 3 it is obvious that phorate gave the best results. Because of the high relative toxicity of this insecticide ($LD_{50}=1,75-4,0$), the choice fell on dimethoate ($LD_{50}=200-300$), which has now been registered for this purpose.

Disadvantages associated with the use of dimethoate as a seed treatment for legume crops include the following:

- Dimethoate influences the process of nodule formation by *Rhizobium* bacteria during the first few weeks after germination. After six weeks, however, this influence is no longer evident. In the case of perennial legumes this influence is regarded as unimportant, since the initial handicap is soon overcome.
- Seed treatment with dimethoate intensifies the sensitivity of the seedlings for damage by soil fungi known as "damping off" organisms.
- Seed treatment with dimethoate has a slight retarding effect on germination of seeds.
- The action of dimethoate is neutralised by the practise of seed-pelleting with lime.

Choice of time of application

Spraying

Besides the application of a suitable insecticide, successful spraying also requires the correct timing of sprays. The choice of time to start the applications is determined by the first winter rains which allow the aestivating eggs to hatch, while the interval between sprays is determined by the period required for the completion of one generation of the pests.

The control effort should be aimed at killing the insects emerging from the aestivating eggs before they can reproduce. The time taken to complete one generation is approximately three weeks.

Seed treatment

To counteract the influence of dimethoate on the process of nodulation by *Rhizobium* bacteria, it is suggested that inoculation of seeds with these bacteria should be done about eight days after seed treatment with dimethoate.

After having been properly dried, treated seed could be stored for a period of up to 3 months after which the effectiveness of the dimethoate will diminish.

Biological control

A number of natural enemies of both the Lucerne Springtail and Black Sandmite are indigenous in the Winter Rainfall Region. They include:

Bdellodes hessei, *Cyta latirostris*, *Odontoscirus* species and *Hoploscirus* species which feed mainly on *Collembola* species.

Anystis baccarum and *Chaussieria capensis* which feed on a variety of insects and mites and whose prey also include the Lucerne Springtail and Black Sandmite.

The fact that these predators cohabit with the pest species, and that the latter continue to exist in pest numbers, suggests that they alone are not capable of controlling the Lucerne Springtail and Black Sandmite effectively.

Three predatory mites were imported during the period 1963-1971 as possible control agents and to supplement the local species. They are:

Bdellodes lapidaria (from Australia)

Neomolgus capillatus (from France via Australia) and *Anystis* sp. A (from France and Morocco)

B. lapidaria and *N. capillatus* feed mainly on *Collembola* species, while *Anystis* sp. A feeds more generally and its prey includes the Lucerne Springtail and Black Sandmite.

Of these introduced species *Neomolgus capillatus* proved to be the least successful in getting established and has disappeared completely from the primary release sites.

B. lapidaria, although showing good initial progress on the primary release site (Walters *et al.*, 1974), has as yet not built up sufficient numbers to allow distribution to secondary release sites.

In this sense *Anystis* sp. A is judged the most successful predator and up to date it has been established on 29 secondary release sites in the south-western districts of the Winter Rainfall Region.

Anystis sp. A takes about three years from the time of release until numbers of the predator have built up sufficiently to allow redistribution from there. Natural distribution of these predators are, however, relatively slow. To overcome this, organised manual distribution is planned as material becomes available, and it is foreseen that every farmer in the south-western districts of the Winter Rainfall Region growing legume pastures should eventually have his own breeding colony from where predator distribution to newly established pastures can be initiated.

The evaluation of the success of the distribution of predators during the secondary distribution phase remains an important facet of this study. The eventual success of the predator not only rests upon the success of its initial colonisation on the secondary release sites, but also on the success with which it is able to bridge the non-pasture period in the rotational cropping system practised.

Publications

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(The above is an interim report and the project is to be continued).

CHEMISTRY

RADIO ISOTOPES

ASSAY

(S)WP.245/2:

RADIO ISOTOPE: ASSAY OF MIXTURES OF RADIO ISOTOPES BY LIQUID SCINTILLATION COUNTING. 1977-1979

J.F. de Villiers, W.A.G. Kotzé and

J.H.M. Karsten

Various mixtures of agriculturally important radio isotopes were analysed with the aid of a liquid scintillation counter with two channels, each fitted with a variable discriminator. Count rates of the individual isotopes in a mixture were calculated by solving two simultaneous linear equations based on channel ratios.

With two β -emitting isotopes in the mixture, the optimum discriminator settings were determined by the P-number method. In the case of a mixture of γ - and β -emitting isotopes the sharp energy peak of the γ -emitting isotope was isolated in one channel and the β -spectrum of the other isotope was counted in the second channel at balance point.

Mixtures of pairs of radio isotopes with various relative activity ratios were analysed at the previously determined discriminator setting. Calculated and true mean counting rates were in excellent agreement and percentage deviation was within acceptable limits. With two β -emitting isotopes in a mixture, the endpoint energy ratio must exceed two in order to obtain reliable results.

Publication

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H-B1.47: Lime and organic matter experiment with maize. 1959
H-Ps.38: Quantitative fertilizer experiment with maize. 1922. D.J. Crafford
N-Ce.106: Fertility studies on the major soil series in Natal:
106/1: - Response of maize to N, P, K and Ca applications on an Ayalon medium sandy loam. 1966. M.P.W. Farina
N-Dd.4: Effect of incorporation of stover on yield and fertilizer requirements of maize. 1966. F.P.C. Blamey
SW-Uk.3: Bemestingsproewe in die droëland-akkerboustreke van Suidwes-Afrika:
3/1(K): - Bemestingsbehoefes van mielies in die noorde van Suidwes-Afrika. 1973. H.C. Hugo, J.C. van der Sandt
T-Tw.4(K): Bemesting en spasiëring van mielies. 1957. J.J. Coetzee
T-Tw.12: Stikstofbemesting van mielies. 1960. J.J. Coetzee
T-Tw.13: Voedingselementvoorsiening aan mielies. 1961. J.J. Coetzee

CULTIVARS

- O-G1.19: Mieliecultivars. 1943. J. Dreyer
O-G1.93: Mieliecultivars onder besproeiing op die Sand-Vetskema. 1961. J. Dreyer
O-Vh.69: Mielieverbouing op Vaalharts:
69/2: - Mieliecultivars. 1965. J. Dreyer, J.H. Pienaar
OK-Do.61: Maize in the Eastern Cape:
61/3: - Maize cultivars for grain at Döhne. 1968. R.S. Marr
61/4: - Maize and sorghum cultivars for grain at Bathurst. 1968. R.S. Marr

INSEKTEPLAE/INSECT PESTS

- H-Ps.104: Proef met die mieliestamrusper:
- 104/1: - Chemiese beheer. 1959. T.W. Drinkwater, M.C. Walters, J.B.J. van Rensburg
 - 104/2: - Meganiese beheer. 1959. M.C. Walters
 - 104/4: - Ekologie. 1959. M.C. Walters
 - 104/5: - Bepaling van ekonomiese skadedrumpel vir die mieliestamrusper *Brusseola fusca* Fuller. 1976. J.B.J. van Rensburg
- H-Ps.258: Blaarspringers (Homoptera:Cicadelliadae) as vektore van streepsiekte by mielies (*Zea mays* L.):
- 258/1: - Taksonomie van die genus *Cicadulina* China. 1977. G.D.J. van Rensburg
- W-Sb.67: Ligrooi mieliestamrusper (*Sesamia calamistis*) in die Winterreënstreek:

KLIMAAT/CLIMATE

- (A)S-Pr.57: Agroklimaat van die Hoëveld- en O.V.S.-streke:
- 57/2: - Invloed van weerkundige faktore op die groeitempo van mielies. 1976. R. Eicker

NEMATODES

- (A)I-Rp.80: Biologie van die grond: dierkundige aspekte:
- 80/10: - Ondersoek na die chemiese beheer van aalwurms wat mielies in Suid-Afrika aanval. 1979. I.W. Louw

ONKRUIDBESTRYDING/WEED CONTROL

- H-Ps.31: Onkruidbestryding met onkruidodders:
- 31/1: - Onkruidbestryding in mielies. 1950. I.D. Hattingh
- N-Ce.129: Mieliegraanproduksie in die Natalstreek:
- 129/2: - Onkruidodderproewe. 1973. J.B. Mallett

PRODUKSIE/PRODUCTION

- H-Ps.245: Produksievermoë van mielies in die Hoëveldstreek:
- 245/1: - Produksievermoë van mielies op 'n Soetmelkgrondserie in die Oos-Vrystaat. 1973. J.P. Pretorius
- N-Ce.129: Maize grain production in the Natal Region:
- 129/1: - Performance of maize hybrids at varying plant populations. 1973. J.B. Mallett
- N-Vl.16: Promotion of maize production in the Natal Region:
- 16/5: - Promotion of improved yields by economic optimum fertilization and improved cultural practices in the Winterton soil conservation district. 1976. B.A. Scott

SIEKTES/DISEASES

- N-Ce.69: Screening of promising maize breeding stocks for resistance to *Helminthosporium turcicum* leaf blight. 1961. H.O. Gevers, J. Lake

TELING/BREEDING

- H-Ps.227: Genetiese beheer van die biochemiese komponente van mielies:
- 227/2: - Verhoging van lisieninhoud van meliegraan. 1967. J.G. du Plessis

- 227/3: - Teling van suikermielies. 1974. J.G. du Plessis
H-Ps.236: Bestandheidsteling van mielies teen siektes:
236/1 - Diplodia-stamvrot (*D. zeae*). 1968. J.G. du Plessis
236/2: - Blaasbrand (*Ustilago maydis*). 1969. H.J. Maree
236/3: - Kop- en pluimbrand (*Sorosporium reilianum*). 1952. J.G. du Plessis
H-Ps.251: Ontwikkeling van teelmetodiek by mielies:
251/1: - Suiwerlynontwikkeling uit verbeterde teelpopulasies van mielies. 1975. H.C. Kühn
H-Ps.252: Seleksie vir morfologiese en fisiologiese hoedanighede by mielies:
252/1: - Teling vir stamsterkte by mielies. 1975. A.P. Fourie
N-U1.20: Breeding of hybrid maize for Natal:
20/1: - Genetics of photoperiodism in maize. 1972. J. Spencer
N-U1.35: Reciprocal recurrent selection as a method of maize breeding with and without visual selection for agronomic characters. 1958. H.O. Gevers
SG-Ps.3: Mielieteling vir weerstandbiedendheid teen streepsiekte:
3/1: - Introduksie en evaluasie van teelmateriaal. 1968. J. Dreyer, J.H. Pienaar
3/2: - Kruisingsprogram. 1968. J. Dreyer, J.H. Pienaar
3/3: - Genepoelteeltprogram. 1968. J. Dreyer, J.H. Pienaar
3/4: - Evaluasie van nuwe basters. 1969. J. Dreyer, J.H. Pienaar

WISSELBOU/ROTATION

- H-B1.28: Grondverbetering deur middel van wisselbou. 1955
H-Ps.33: Grasrusoes- en wisselbouproef. 1953. D.J. Crafford
H-Ps.37: Wisselbou en grondbewerking vir mielies. 1953

GRAANSORGHUM/GRAIN SORGHUM

BEMESTING/FERTILIZERS

- T-Tw.10: Bemesting en spasiëring van graansorghum. 1957. J.J. Coetzee

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.125: Biologie, ekologie en gedrag van die sorghumstamruspe, *Chilo zonellus*. 1965. H. van Hamburg

PRODUKSIE/PRODUCTION

- H-Ps.247: Produksievermoë van graansorghums in die Hoëveldstreek:
247/1 - Produksievermoë van graansorghums op 'n Soetmelkgrondserie in die Oos-Vrystaat. 1973. G.P. Stemmet

BOKWIET/BUCKWHEAT

CULTIVARS

- T-Ng.65: Bokwietnavorsing:
 65/1: - Cultivarproewe. 1974. S.P. Fourie, E.B. Birch

Kleingraan/Small Grain

KORING/WHEAT

BEMESTING/FERTILIZERS

- O-Vh.75: Koringteling vir besproeiingsgebiede van die Oranje-Vrystaatstreek:
 75/5: - Invloed van stikstofpeile, plantpopulasie en plantdatum op verskillende koringcultivars te Vaalharts. 1970. H.B. Fick, J.G. van Niekerk
- SW-Hp.3: Koringproduksie op die Hardapbesproeiingskema:
 3/2: - Koringbemesting. 1973. G.S.P. Vink
- W-Lg.4: Mis- en strooiproef met koring. 1973. J.E. Wicht
- W-Sb.149: Kalibrering van chemiese ontledingsmetodes vir diagnostiese doeleindes:
 149/3: - Invloed van kaliumbemestingspeile op die groei en opbrengs van koring. 1977. C.P. de L. Beyers
- W-Sb.150: Invloed van omgewingstoestande en verbouingsmetodes op die groeiwyse en agronomiese reaksie van koring:
 150/2: - Invloed van blaartoediening van stikstof by spesifieke groeistadiums op die kwaliteit van koringmeelblom. 1978. S.A. Barnard

BESPROEIING/IRRIGATION

- SW-Hp.3: Koringproduksie op die Hardap-besproeiingskema:
 3/4: - Besproeiingsbehoefte van koring. 1974. G.S.P. Vink

BEWERKING/CULTIVATION

- O-Vh.1: Stoppelbewerking by koring en grondbone. 1952. J. Dreyer
- SW-Hp.3: Koringproduksie op die Hardapbesproeiingskema:
 3/3: - Invloed van saaidigtheid en planttyd op die opbrengs van sekere koringcultivars. 1973. G.S.P. Vink
- *W-Lg.7: Grondbewerkingsproef met koring. 1933. J.E. Wicht, C.P. de L. Beyers
- W-Lg.13: Optimum integration of farming practices:
 13/3: - Cultivation trial for possible improvement of wheat yield in prevailing production systems in the Rûens. 1976. J.E. Wicht, G.A. Agenbag, J.H. Loots, C.P. de L. Beyers, M.D. Strauss, F.J.C. Hugo

CULTIVARS

- H-B1.4: Koringteling vir die somerreëng gebied:
 4/1: - Introduksie en evaluasie van cultivars. 1954. J.A.M. van der Mey, K.W. Pakendorf
- N-Dd.8: Production of wheat in Natal:

- *8/1 - Introduction and evaluation of wheat cultivars for dryland production in Northern Natal. 1973. F.P.C. Blamey
- OK-Do.71: Kleingraan in die Oos-Kaap:
- 71/1: - Koringcultivars vir droëlandproduksie. 1972. R.S. Marr
- 71/2: - Koringcultivars onder besproeiing. 1972. R.S. Marr
- O-Vh.75: Koringteling vir die besproeiingsgebiede van die Oranje-Vrystaatstreek:
- 75/1: - Strooisterktewaarneming by koring. 1956. J.H. Pienaar, H.B. Fick, J.G. van Niekerk
- 75/3: - Koringcultivars. 1940. J.H. Pienaar, H.B. Fick, J.G. van Niekerk
- SW-Hp.3: Koringproduksie op die Hardap-besproeiingskema:
- 3/1: - Koringcultivars. 1972. G.S.P. Vink
- T-Rp.6(K): Koringcultivarproewe op die vernaamste besproeiingskemas in die Transvaalstreek. 1961. J.A.M. van der Mey, I.B. Edwards
- W-Sb.40: Evaluering van kleingrane:
- 40/1(K): - Evaluering van koringlyne in die Winterreënstreek (Elite-koringproef). 1974. J.E. Wicht, B.J. Stander, S.A. Barnard, J.H. Loots, J.W. Loubser
- 40/5: - Evaluering van koringlyne onder besproeiing in die Winterreënstreek. 1974. S.A. Barnard, J.E. Wicht
- 40/6: - Evaluering van alle vrygestelde koringcultivars ten opsigte van opbrengs en kwaliteit in die winter- en heeljaarreënggebiede. 1974. J.E. Wicht, B.J. Stander, J.E. Volschenk, A. Smit, S.A. Barnard, J.H. Blomerus, J.H. Loots, J.W. Loubser
- W-Sb.143: Aanpassingstudies op wintergraansoorte met betrekking tot ligintensiteit, ligduurte, temperatuur en vogstremming:
- 143/2: - Invloed van vogstremming op die morfologie, osmotiese potensiaal en fotosintese gedurende opeenvolgende groeistadiums van skemerkoring. 1972. J.E. van Niekerk
- W-Sb.150: Invloed van omgewingstoestande en verbouingsmetodes op die groeiwyse en agnomiese reaksie van koringcultivars:
- 150/1: - Invloed van klimaatsone op saaityd, saaidigtheid, bemesting en cultivarkombinasie. 1974. P.C.J. Maree, B.J. Stander, J.E. Volschenk, S.A. Barnard, J.H. Loots, J.E. Wicht, J.H. Blomerus

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.24: Beheer van insekte in opgebergde saad en saadprodukte:
- 24/3: - Gebruik van bestraling vir die beheer van insekte in graan en graanprodukte. 1970. H. van Tonder
- W-Sb.157: Plantluise geassosieer met kleingraanverbouing in die Winterreënstreek:
- 157/1: - Identiteit en voorkoms van plantluise. 1977. F. du Toit, S.S. Walters vir die beheer van insekte in graan en graanprodukte. 1970. H. van Tonder
- 157/2: - Plaagstatus van graanplantluise geassosieer met kleingraanverbouing. 1978. F. du Toit, S.S. Walters

ONKRUIDBESTRYDING/WEED CONTROL

- H-Ps.31: Onkruidbestryding met onkruidodders:
- 31/4: - Bestryding van onkruid in somerkoring. 1955. I.D. Hattingh

SIEKTES/DISEASES

- H-B1.67: Evaluering van koringcultivars vir roesbestandheid. 1967. J.N.W. de Jager
 W-Sb.3: Stam- en blaarroes (*Puccinia graminis tritici* en *P.triticina*) van koring. 1954. J.A. Truter

TELING/BREEDING

- H-B1.4: Koringteling vir die somerreëngebied:
 4/2: - Kombinasieteling vir ontwikkeling van uitstaande nuwe koringcultivars. 1965. J.A.M. van der Mey, J.N.W. de Jager, K.W. Pakendorf
 4/3: - Terugkruising vir stamroesweerstand. 1954. J.A.M. van der Mey, J.N.W. de Jager, K.W. Pakendorf
 4/5: - Bepaling van die erflike beheer van stamroesweerstand by koring en van die interverwantskappe van die weerstandsgene. 1964. J.A.M. van der Mey, J.N.W. de Jager, K.W. Pakendorf
 T-Rp.2: Koringteling en -seleksie. 1954. I.B. Edwards, J.A.M. van der Mey
 W-Wg.6: Koringteling in die Winterreënstreek:
 6/1: - Ondersoek na die genetiese komponente van variasie in broodkoring in die Winterreënstreek. 1974. G.F. Marais
 6/2: - Skepping van variasie in die koringteeltprogram deur middel van fisiese en chemiese mutagense. 1974. H.A. van Niekerk, C.F. Quass

GARS/BARLEY

CULTIVARS

- W-Sb.40: Evaluering van kleingrane:
 40/3(K): - Evaluering van garslyne in die Winterreënstreek (Elite-garsproef). 1974. J.E. Wicht, B.J. Stander

ONKRUIDBESTRYDING/WEED CONTROL

- W-Sb.77: Chemical weed control in winter cereal crops:
 77/7: - Gevoeligheid van gars by verskillende groeistadiums teenoor hormoononkruidodders en hul effek op opbrengs en sekere kwaliteitseienskappe. 1979. J.W. Loubser

PRODUKSIE/PRODUCTION

- W-Sb.151: Produksie van brougars:
 151/2: - Invloed van verbouingsmetodes op die opbrengs en kwaliteit van gars. 1974. B.J. Stander

TELING/BREEDING

- W-Wg.10: Breeding new barley cultivars. 1976. B.E. Eisenberg

ROG/RYE

CULTIVARS

- W-Sb.40: Evaluering van kleingrane:
 40/4: - Evaluering van roglyne in die Winterreënstreek (Elite-rogproef). 1974. J.E. Wicht, B.J. Stander

HAWER/OATS

CULTIVARS

- H-B1.5: Cultivarproef met hawer. 1948. G.D. Joubert, H.A. Smit
 O-Vh.68: Alternatiewe akkerbougewasse onder besproeiing:
 68/6: - Hawercultivars. 1966. J.G. van Niekerk, H.B. Fick, J.H. Pienaar
 W-Sb.40: Evaluering van kleingrane:
 40/2(K): - Evaluering van hawerlyne in die Winterreënstreek (Elite-hawerproef). 1974. J.W. Loubser, J.E. Wicht, B.J. Stander

TELING/BREEDING

- W-Wg.9: Oat breeding. 1927. B.E. Eisenberg

Proteïen- en Olieryke Sade/Protein and Oil-rich Seeds

GRONDBONE/GROUNDNUTS

BEMESTING/FERTILIZERS

- N-Dd.3: Groundnut production in Natal:
 3/11: - Calcium, magnesium and sulphur requirements of groundnuts on the 'Leksand' soil series. 1967. F.P.C. Blamey, J. Chapman
 T-Tw.7: Bemesting en spasiëring van grondbone. 1957. J.J. Coetzee

CULTIVARS

- H-Ps.259: Nasionale grondbooncultivarevaluasieprogram
 N-Dd.3: Groundnut production in Natal:
 3/3: - Yield experiments. 1962. F.P.C. Blamey, J. Chapman

FISIOLOGIE/PHYSIOLOGY

- H-Ps.255: Studie van die groei, ontwikkeling en reproduksiepatroon by grondbone (*Arachis hypogaea* L):
 255/1: - Invloed van plantdatum op die ontwikkeling en reproduksie van Spanish-tipe. 1976. E.L. da Silva Ferreira
 255/2: - Invloed van spasiëring op die reproduksie van grondbone. 1976. C.J. Swanevelder
 255/3: - Invloed van grondbedekking (operd) op die reproduksie van grondbone. 1976. D.J. Theunissen
 255/4: - Blompatroon en reproduksiedoeltreffendheid van 'n Spanish-tipe grondboon. 1976. D.J. Theunissen
 255/5: - Groei-analise van 'n Spanish-tipe grondboon. 1976. E.L. da Silva Ferreira

- 255/7: - Opbrengverskille met volledige beheer deur chemiese middels soos beïnvloed deur groeiseisoenslengte. 1977. C.J. Swanevelder

GRONDVOGVEREISTES/SOIL MOISTURE REQUIREMENTS

- O-G1.117: Grondvogtoestande by gewasverbouing:
117/8: - Strategiese vogbehoefte- en oesdatumbepalings met grondbone onder besproeiing. 1973. J. Dreyer, W. Jansen, A.J. Greyling, P.C.J. Dendy, E. Maree

ONKRUIDBESTRYDING/WEED CONTROL

- H-Ps.31: Onkruidbestryding met onkruidodders:
31/3: - Onkruidbestryding in grondbone. 1953. I.D. Hattingh

SIEKTES/DISEASES

- N-Dd.3: Groundnut production in the Natal Region:
3/13: - Epiphytology and control of foliar diseases in groundnuts in northern Natal. 1977. F.P.C. Blamey

TELING/BREEDING

- H-Ps.243: Grondboonteling:
243/1: - Evaluering en klassifikasie van introduksies. 1974. P.J.A. van der Merwe
243/2: - Teling vir droëlandtoestande. 1974. P.J.A. van der Merwe
243/3: - Teling vir besproeiingsgebiede. 1974. P.J.A. van der Merwe
243/4: - Ondersoek na genetiese verskuiwing as gevolg van pitsifting. 1974. P.J. van Rooyen

SONNEBLOM/SUNFLOWER

BEMESTING/FERTILIZERS

- N-Dd.10: Sunflower production in the Natal Region:
*10/4: - Boron nutrition of sunflowers on a Doveton clay loam. 1976. E.P.C. Blamey, J. Chapman
10/5: - Nitrogen and phosphorus fertilization of sunflowers on a Doveton clay loam. 1976. P.F.C. Blamey

CULTIVARS

- N-Dd.10: Sunflower production in the Natal Region:
10/1: - Introduction and evaluation of sunflower cultivars for Northern Natal. 1974. F.P.C. Blamey, J. Chapman
T-Rp.47: Sunflower cultivars:
47/1: - National evaluation of oil cultivars. 1978. E.B. Birch, W.T. Engelbrecht

PRODUKSIE/PRODUCTION

- H-Ps.246: Produksievermoë van sonneblomme in die Hoëveldstreek:

- 246/1: - Produksievermoë van sonneblomme op 'n Soetmelk-grondserie in die Oos-Vrystaat. 1973. C.J. Swanevelder

TELING/BREEDING

- H-Ps.244: Sonneblomteling:
- 244/1: - Introduksie en evaluering. 1974. W.J. Vermeulen
- 244/2: - Teling van oopbestuifde cultivars. 1974. W.J. Vermeulen
- 244/3: - Teling van lyne vir bastersaadproduksie. 1974. W.J. Vermeulen
- 244/4: - Kombineervermoë tussen oopbestuifde cultivars. 1974. P.J. van Rooyen

SOJABONE/SOYBEANS

CULTIVARS

- H-BI.11: Cultivarproef met sojabone. 1948.
- H-Ps.212: Sojabone:
- 212/1: - Cultivarproewe. 1964. C.J. Swanevelder
- H-Ps.260: National soybean cultivar trials:
- 260/2: - Differential mechanisms of drought stress compensation in determinate soybean cultivars. 1979. R. Grant

PRODUKSIE/PRODUCTION

- H-BI.62: Verbouing van sojabone in die Oos-Vrystaat:
- 62/1: - Plantdigtheid en spasiëring. 1968
- H-Ps.248: Produksievermoë van sojabone in die Hoëveldstreek:
- *248/1: - Produksievermoë van sojabone op 'n Soetmelk-grondserie in die Oos-Vrystaat. 1973. C.J. Swanevelder

TELING/BREEDING

- H-Ps.4: Teling van sojabone. 1926. P.J. van Rooyen
- N-UI.49: Soybean breeding in the Natal Region. 1968. Rona V. van Niekerk

DROEBONE/DRY BEANS

CULTIVARS

- H-Ps.238: Droëboonteelt:
- 238/1: - Introduksie en evaluasie. 1970. W.J. Vermeulen
- H-Ps.262: Nasionale droëbooncultivarproewe

PRODUKSIE/PRODUCTION

- H-Ps.249: Produksievermoë van droëbone in die Hoëveldstreek:
- 249/1: - Produksievermoë van droëbone op 'n Soetmelkgrondserie in die Oos-Vrystaat. 1973. C.J. Swanevelder

SIEKTES/DISEASES

- (A)PS-Pr.37: Bakteriese siektes van akkerbougewasse:
 37/2: - Aard en omvang van saadgedraagde bakteriese siektes by gesertifiseerde
 boontjiesaad. 1974. C.C. Deschodt

TELING/BREEDING

- H-Ps.238: Droëboonteelt:
 - Teling van bone vir inmaakdoeleindes. 1970. W.J. Vermeulen

LUPIENE/LUPINS

CULTIVARS

- W-Lg.9: Cultivarproef met lupiene. 1958. J.E. Wicht

INSEKTEPLAE/INSECT PESTS

- W-Sb.17: Biologie en bestryding van *Heliothis armigera* by lupiene in die Winterreënstreek.
 1956. S.S. Walters

TELING/BREEDING

- W-Wg.4: Teling van lupiene. 1943. K.W. Pakendorf

KASTEROLIE/CASTOR-OIL

BEMESTING/FERTILIZERS

- T-Tw.6: Bemesting en spasiëring van kasterolieplante. 1959. J.J. van der Merwe

Ander Akkerbougewasse/Other Agronomic Crops

AARTAPPELS/POTATOES

BEMESTING/FERTILIZERS

- N-Ce.19: Potato growing in the Natal Region:
 19/13: - Soil fertility (N,P,K) studies and soil-test calibration on the major potato soils.
 1977. R.J. Rutherford

BESPROEING/IRRIGATION

- O-Gl.117: Grondvogtoestande by gewasverbouing:
 117/11(K): - Stikstof- en kaliumbemesting van aartappels by verskillende
 besproeiingsfrekwensies in die Douglasbesproeiingsgebied. 1978. G.S. Cloete,
 H.L.G. Potgieter, J.P. van Dyk

CULTIVARS

- N-Ce.19: Potato growing in the Natal Region:
 19/12: - Cultivar evaluation. 1977. R.J. Rutherford
- T-Rp.12: Veredeling van aartappels:
 12/1: - Cultivarproef. 1963. F.I. du Plooy, S.W.L. de Kock, B.C. Greyling, A.F. Visser, G. van der Linde
 12/6: - Introduksie en evaluering van buitelandse aartappelcultivars. 1973. F.I. du Plooy, S.W.L. de Kock, B.C. Greyling, A.F. Visser, G. van der Linde
- T-Rp.24: Agronomiese navorsing met aartappels:
 24/13: - Invloed van plantdatum op die produksie van enkele aartappelcultivars. 1979. G.S. Cloete
- W-Sb.135: Aartappelproduksie in die Winterreënstreek:
 135/1: - Evaluasie van aartappelcultivars in die Winterreënstreek. 1974. G.A. Agenbach, J.H. Blomerus, J.E. Wicht

GROEIREGULEERDERS/GROWTH REGULATORS

- T-Rp.24: Agronomiese navorsing met aartappels:
 24/6: - Spuitstimulerende middels ter verbreking van knolrusperiode. 1977. J.J. Bornman, K.P. Prinsloo

GRONDVOGVEREISTES/SOIL MOISTURE REQUIREMENTS

- O-Gl.117: Grondvogtoestande by gewasverbouing:
 *117/10: - Stikstof- en kaliumbemesting van aartappels by verskillende besproeiingspeile. 1977. C. Engelbrecht, P.J. Snyman, H.L.J. Potgieter

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.87: Bio-ecology of the potato tuber moth:
 87/2: - Utilization of imported natural enemies. 1966. R.H. Watmough
- T-Rp.20: Virussiektes van aartappels:
 20/4: - Vlugpatrone, heersende winde en bronne van luise met die oog op die voorspellingsdiens vir moerprodusente. 1976. R.J.H. Venter
 20/8: - Migrasiegewoontes van die plantluisvektore van aartappelvirusse. 1977. H. Bouwer, I. Griesel
- T-Rp.44: Studie van skadelike insekte (uitgesonderd virusvektore) by aartappels/Study of harmful insects in potatoes:
 44/1: - Beheer van snywurms (hoofsaaklik *Euxoa segetum*). 1978. R.J.H. Venter
 44/2: - Beheer van swart mieliekewers *Heteronychus sanctae-helenae*. 1978. R.J.H. Venter
 44/3: - Bioëkologiese studies van die swartmieliekewer *Heteronychus arator*. 1978. H.H. Gouse, D.M. du Toit, A. Barnard
 44/4: - Bioëkologiese studies op die aartappelsnuitkewer (*Sciobius horni* Marshall) en doeltreffende beheer. 1979. J.F. Kirsten
 44/5: - Beheer van aartappelmot (*Phthorimaea operculella* Zeller) op gestoorde aartappels. 1979. J.F. Kirsten

- W-Sb.153: Insektekundige en verwante probleme by die verbouing van aartappels en aartappelmoere:
 153/2: - Migrasiegewoontes van die plantluisvektore van aartappelvirsse in die verskillende saadaartappelproduserende gebiede van die Vrystaatstreek. 1977. T.C. Botha

MOERE/SEED POTATOES

- (A)PS-Pr.1/1: Methods of seed potato production. 1956. J.E. van der Plank, L.P. Meyer
 T-Rp.24: Agronomiese navorsing met aartappels:
 24/7: - Invloed van moergrootte en spasiëring op moerproduksie onder droëlandtoestande. 1977. J.J. Bornman, K.P. Prinsloo, G.J. van der Linde
 24/11: - Invloed van plantdatum en stadium van lofverwydering op die produksie van aartappelmoere te Rietrivier. 1980. G.S. Cloete

NEMATODES

- (A)I-Pr.115: Bioëkologie en bestryding van die aartappelsistaalwurm *Heterodera rostochiensis* en die beetsistaalwurm *Heterodera schachtii* in Suid-Afrika:
 115/1: - Ondersoek na die biologiese beheer van die aartappelsistaalwurm *Heterodera rostochiensis* in Suid-Afrika. 1972. K.P.N. Kleynhans

ONKRUIDBEHEER/WEED CONTROL

- T-Rp.24: Agronomiese navorsing met aartappels:
 24/8: - Verdraagsaamheid van verskillende cultivars onder besproeiing teenoor vooropkomstoeienings van metribusin. 1978. T. Duvenhage, K.P. Prinsloo, G.P. van der Linde
 24/9: - Bestandheid van besproeide BP1-aartappels op verskillende groeistadia teenoor metribusin op sanderige kleigrond. 1978. T. Duvenhage, K.P.P. Prinsloo, G.P. van der Linde

- W-Sb.135: Aartappelproduksie in die Winterreënstreek:
 135/3: - Onkruidbeheer in aartappels. 1977. G.A. Agenbag, A.L.P. Cairns

PRODUKSIE/PRODUCTION

- N-Ce.19: Potato growing in the Natal region:
 19/11: - Effect of irrigation intensities on potato cultivar yields. 1974. R.D. Mould, R.J. Rutherford
 T-Rp.12: Veredeling van aartappels:
 12/4: - Invloed van planttyd, oestyd en spasiëring op die opbrengs van verskillende aartappelcultivars. 1970. J.J. Bornman, K.P. Prinsloo
 T-Rp.24: Agronomiese navorsing met aartappels:
 24/10: - Invloed van plant- en bemestingstegnieke op aartappelproduksie te Glen. 1980. G.S. Cloete
 24/12: - Invloed van moergrootte en plantpatroon op aartappelproduksie te Sandvet. 1980. G.S. Cloete

SIEKTES/DISEASES

- N-Ce.125: Disorders of seed potato tubers:

- 125/1: - Incidence of pathogenic micro-organisms on the surface of potato tubers. 1973. B.W. Young
- 125/2: - Black scurf and stem canker caused by *Rhizoctonia solani*. 1973. B.W. Young
- T-Rp.20: Aartappelvirussiektes:
- 20/1: - Beheer van aartappelbladrol deur sistemiese insekdoders. 1968. A. Barnard, R.J.H. Venter, M. Louw, D. du Toit, G. van der Linde
- 20/3: - Opsporing en identifikasie van aartappelvirussiektes. 1971. P.J. Prins, J.L.F. Dutrieux, E.A. Hemmes
- 20/5: - The inactivation of potato viruses by means of thermotherapy and meristem cultures. 1976. J.L.F. Dutrieux
- 20/6: - Beweging van die aartappelrolbladvirus (PLRV) in die aartappelplant. 1976. E.A. Hemmes
- 20/9: - Plantluisrolbladviruskompleks en moerproduksie. 1978. R.J.H. Venter
- 20/10: - Invloed van plantdatum op die voorkoms van virussiektes by aartappels in die Christianagebied. 1978. T.C. Botha
- 20/11: - Invloed van plantdatum op die voorkoms van virussiektes by aartappels in die Douglasgebied. 1978. T.C. Botha
- 20/12: - Gedrag van bladrolvirus (PLRV) by verskillende aartappelcultivars. 1979. D.C.A. Hoffman
- 20/13: - Influence of PVX on potato cultivars. 1980. J.L.F. Dutrieux, A.C. Jandrell
- T-Rp.23: Swamsiektes van aartappels:
- 23/4: - Voorspelling van aartappellaatroes-epidemies in die Transvaal. 1968. A.C. Jandrell, F.I. du Plooy, J.L.F. Dutrieux, J. van Reenen, A. Kotze, M.E.L. Buys, G.G. Hill
- 23/6: - Studie en beheer van bruinskurf - *Streptomyces scabies*. 1977. E.A. Hemmes
- 23/7: - Die chemiese beheer van droëvrot. 1979. A.C. Jandrell, Joke van Reenen, Madga Nel
- 23/8: - Ecology and control of black scurf. 1979. B.W. Young
- W-Sb.153: Insektekundige en verwante probleme by die verbouing van aartappels en aartappelmoere in die Winterreënstreek:
- 153/1: - Migrasiegewoontes van plantluisvektore van aartappelrolbladvirus (ARV) in die verskillende aartappelproduserende gebiede van die Winterreënstreek. 1974. S.S. Walters, F. du Toit

TELING/BREEDING

- T-Rp.12: Veredeling van aartappels:
- 12/2: - Teling. 1963. F.I. du Plooy, S.W.L. de Kock, A.F. Visser, B.C. Greyling, G. van der Linde
- 12/7: - Genetiese studies. 1973. A.F. Visser, F.I. du Plooy

KATOEN/COTTON

BESPROEING/IRRIGATION

- T-Bt.11: Besproeiing van katoen in die Oos-Transvaalse Laeveld:
- 11/1: - Uitwerking van grondvogvariasie op opbrengs. 1966. M.C. Dippenaar

- T-Lk.3: Vog- en besproeiingsbehoefte van katoen:
 3/1: - Invloed van vogtekorte tydens verskillende groeiperiodes op katoen. 1977. M.C. Dippenaar

CULTIVARS

- T-Lk.2: Veredeling van katoen:
 2/2: - Introduksies. 1974. H.G. van Heerden, C.G. Theron, R.A. Gomes-Roderigues
 2/4: - Nasionale kultivarproewe. 1975. H.G. van Heerden, C.G. Theron, M.C. Dippenaar
- T-Lk.4: Katoenteling vir die westelike besproeiingsgebiede:
 4/1: - Introduksie en evaluering van kultivars. 1963. C.G. Theron, W.H. van Staden
 4/4: - Opbrengsproef. 1961. C.G. Theron, W.H. van Staden
 4/5: - Kultivarproewe. 1960. C.G. Theron, W.H. van Staden

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.97: Afbreking en vermindering van plaagbeheermiddelreste:
 97/3: - Vermindering van plaagbeheermiddels op katoen. 1975. L.P. van Dyk, N.C.J. Basson
- (A)I-Pr.103: Influence of pesticides, natural enemies and cultural practices on populations of *Tetranychus telarius*, *T. loubardii* and *T. ludeni*. 1969. C.N. van Driel
- T-Lk.5: Beheer van rooispinnekop, *Tetranychus* spp. op katoen:
 5/1: - Faktore wat beheer met sistemiese mytmiddels beïnvloed. 1979. D.P. de Beer
 5/2: - Evaluasie en biologie van predatore met die oog op die ontwikkeling van 'n geïntegreerdebeheerprogram. 1979. D.P. de Beer, Nicolene van Zyl

PRODUKSIE/PRODUCTION

- O-Gl.117: Grondvogtoestande by gewasverbouing:
 117/5: - Invloed van besproeiingspeile, stikstofpeile en plantbevolking op katoenproduksie. 1970. J. de Kock
- O-Gl.132: Ondersoek na die rooidoodprobleem by katoen in die westelike besproeiingsgebiede:
 132/4: - Invloed van vog, temperatuur, grondsterkte, lugvoorsiening en toeganklike voedingselementinhoud op die voeding en produksie van katoen. 1973. J. de Kock, M. van Z. Pellissier, G.S. Cloete
- T-Lk.1: Meganisasie van produksiepraktyke by katoen:
 1/2: - Doeltreffendheid van chemiese bladvalmiddels onder verskillende toestande. 1975. M.C. Dippenaar

TELING/BREEDING

- T-Lk.2: Veredeling van katoen:
 2/1: - Teling en seleksie. 1974. H.G. van Heerden, C.G. Theron
- T-Lk.4: Katoenteling vir die westelike besproeiingsgebiede:
 4/2: - Terugkruising. 1963. C.G. Theron, W.H. van Staden
 4/3: - Seleksie. 1953. C.G. Theron, W.H. van Staden

- 4/6: - Onderzoek na die natuurlike kruisbestuiwing van katoen op Uppington. 1966. C.G. Theron
- 4/7: - Saadvermenigvuldiging. 1965. C.G. Theron, W.H. van Staden

TABAK/TOBACCO

BEMESTING/FERTILIZERS

- (S)T.4: Ekstraksiemetodes vir die bepaling van toeganklike fosfaat en die korrelasie met groei en opbrengs van tabak. 1956. H.G. Snyman
- (S)T.20: Katioonvoeding van tabak:
- *20/11: - Invloed van tye van toediening op stikstofopname deur tabak. 1972. J.J. du Toit
- 20/12: - Stikstofindekse vir en stikstoflewering van tabakproduserende gronde en in besonder die Arcadiaserie. 1972. J.J. du Toit
- *20/13: - Gevoeligheid van tabak teen aluminiumtoksisiteit. 1973. J.J. du Toit, P.J. Shawe
- 20/14: - Spoorelementvoeding van tabak. 1973. (susp.)
- 20/15: - Bepaling van die verwantskap tussen die voedingselementstatus van gronde in die verskillende tabakproduserende gebiede en die chemiese samestelling en opbrengs van tabak. 1973. J.J. du Toit, H.J. Boshoff, F.J. Shawe

BIOCHEMIE/BIOCHEMISTRY

- (S)T.132: Control of suckers in tobacco:
- 132/1: - Efficacy tests with chemical sucker control agents. 1968. Louise van der Westhuizen
- (S)T.310: Faktore wat tabakrooksamstelling beïnvloed:
- 310/1: - Skeiding, identifikasie en kwantitatiewe bepaling van tabakrookkomponente. 1965. J.G. Nel
- 310/2: - Fisiese en chemiese eienskappe van blaartabak en die invloed daarvan op rooksamstelling en blaarkwaliteit. 1965. J.G. Nel
- 310/3: - Invloed van vorige verbouings- en prosesseringsgeskiedenis van tabak op die samestelling van die blare en rook. 1965. J.G. Nel
- (S)T.315: Residu's van chemiese bestrydings- en beheermiddels op tabak:
- 315/1: - Afbraak van insekbestrydingsmiddels op tabak. 1969. R.J. van Wyk

CULTIVARS

- (S)T.109: Cultivarproewe met tabak:
- 109/1: - Oonddroogtabak. 1951. M.P. Lamprecht
- 109/2: - Donker lugdroogtabak. 1965. M.P. Lamprecht
- 109/3: - Ligte lugdroogtabak. 1965. M.P. Lamprecht
- 109/4: - Burleytabak. 1956. M.P. Lamprecht
- 109/6: - Turkse tabak. 1917. W.J.C. van der Merwe

HIDROLOGIE/HYDROLOGY

- (S)T.131: Waterhuishouding van die tabakplant:

- 131/3: - Invloed van vloed- en sprinkelbesproeiing van oonddroogtabak. 1968. Louise van der Westhuizen
- 131/6: - Besproeiingspraktyke vir die vestiging van plantjies op kleigrondwalle. 1976. E. van der Westhuizen

INSEKTEPLAE/INSECT PESTS

- (S)T.207: Biology and control of insects in field tobacco:
 *207/2 - Studies on insect transmission of the tobacco leaf-curl virus. 1967. J. Thatcher
- (S)T.208: Biology and control of insects in stored tobacco:
 208/2: - Chemical control of the cigarette beetle, *Lasioderma serricornis*, in tobacco warehouses. 1969. J.M. Els
- (S)T.209: Ondersoeke na die sporadiese voorkoms en beheer van tabakinsekte wat gedurende spesifieke seisoene van onmiddellike belang kan wees. 1973. E. Eulitz
- (S)T.210: Amerikaanse bolwurm - biologie en beheer van die plaag op tabak:
 *210/1: - Vestiging van 'n bolwurmkultuur. 1977. E.G. Eulitz

NEMATODES

- (S)T.204: Control, distribution and effect of temperature and host resistance on *Meloidogyne* spp. of tobacco and the role of other nematodes and methods of extraction:
 204/2: - Chemical control of eelworm in tobacco seedbeds. 1959. J.M. Els
 204/7: - Plant parasitic eelworm (not *Meloidogyne*) on tobacco. 1959. J.M. Els

ONKRUIDBEHEER/WEED CONTROL

- (S)T.133: Weed control in tobacco:
 133/1: - Efficacy of chemical control. 1968. Louise van der Westhuizen

SIEKTES/DISEASES

- (S)T.211: Potato virus Y-group virus of burley tobacco in the R.S.A.:
 *211/1: - Purification and electron microscopy of PVY-group virus of burley tobacco. 1977. J. Thatcher
- (S)T.306: Beheer van tabaksaadbeddingsiektes:
 306/1: - Swart wortelvrot van tabak veroorsaak deur die swam *Thielaviopsis basicola* (Berk. en B.) Ferraris en die beheer daarvan. 1977. R.J. van Wyk
- (S)T.309: Studie van die voorkoms en bestryding van die rooiroessiekte by tabak:
 *309/1: - Besmettingstegnieke. 1965. R.J. van Wyk
- (S)T.313: Studies met plantpatogeniese *Pseudomonas*-spesies met spesiale verwysing na dié wat tabak parasiteer:
 313/2: - Isolasië van die veroorsakende organisme(s), tegnieke vir kunsmatige besmetting en beheer van hoekvlek by tabak. 1971. R.J. van Wyk
- (S)T.316: Ondersoeke na die sporadiese voorkoms en beheer van tabaksiektes wat gedurende spesifieke seisoene van onmiddellike belang kan wees. 1973. J. Thatcher
- (S)T.317: Studie oor die voorkoms en beheer van die swartstamsiekte van tabak (*Phytophthora nicotianae* var *nicotianae*):

SPASIËRING/SPACING

- (S)T.129: Spasiëring en top van tabak:
- 129/1: - Oonddroogtabak. 1966. M.P. Lamprecht
 - 129/2: - Donker lugdroogtabak. 1966. M.P. Lamprecht
 - 129/3: - Ligte lugdroogtabak. 1966. M.P. Lamprecht
 - 129/4: - Burleytabak. 1966. M.P. Lamprecht

TELING/BREEDING

- (S)T.111: Teling van *Nicotiana tabacum*-cultivars weerstandbiedend of immuun teen knopwortelnematodes (*Meloidogyne* spp.). 1958. A.P.F. Cornelissen
- (S)T.113: Inteling van die manlik-steriliteitsfaktor in sommige *Nicotiana tabacum*-cultivars. 1956. A.P.F. Cornelissen
- (S)T.128: Teelwaardebepaling by *Nicotiana tabacum*:
- 128/1: - Donker lugdroogtabak. 1962. M.P. Lamprecht
 - 128/2: - Oonddroogtabak. 1961. M.P. Lamprecht
 - 128/3: - Ligte lugdroogtabak. 1967. M.P. Lamprecht, S.E. van der Westhuizen
 - 128/4: - Burley tobacco. 1969. M.P. Lamprecht
 - 128/5: - Seleksie van siekteweerstandbiedende tabak. 1952. M.P. Lamprecht
 - 128/6: - Gebruik van haploïde plante in tabakteling. 1976. S.E. v.d. Westhuizen

WISSELBOU/ROTATION

- (S)T.135: Verbouing van tabak direk na koring onder besproeiing:
- 135/1: - Plantmetodes en bewerking in Wes-Transvaal. 1976. Louise van der Westhuizen

LUSERN/LUCERNE

BEMESTING/FERTILIZERS

- OK-Do.62: Mineral nutrition of lucerne:
- *62/8: - Effect of Iscor open-hearth slag compared with calcium carbonate on soil pH and phosphorus uptake by lucerne. 1973. R.B.A. Harry
- W-Oh.7: Lusernverbouing in die Klein Karoo:
- 7/2: - Bemesting van lusern vir hooi- en saadproduksie. 1974. S.A. Barnard, D.J. Beukes, G.A. Agenbag, J.E. Wicht
- W-Oq.3: Kalk- en kaliumproef met lusern. 1954. G.R. Thompson, J.H. Blomerus

BESPROEÏING/IRRIGATION

- W-Oh.7: Lusernverbouing in die Klein Karoo:
- 7/1: - Besproeiing volgens panverdamping vir optimale hooi- en saadproduksie. 1974. S.A. Barnard, D.J. Beukes, G.A. Agenbag

CULTIVARS

- K-Gf.69: Brakbestandheid van luserncultivars. 1961. G.C. de Kock

- N-Ce.80: Lucerne in Natal:
 *80/3: - Evaluation of cultivars, strains and selections. 1962. D. le Roux

INSEKTEPLAE/INSECT PESTS

- W-Sb.31: Bestryding van die lusernvlooi en die swartsandmiet:
 31/1: - Bestryding van die lusernvlooi (*Sminthurus viridis*) en die swart sandmyt (*Halotydeus destructor*). 1960. J. Lombard

PRODUKSIE/PRODUCTION

- W-Oh.7: Lusernverbouing in die Klein Karoo:
 7/3: - Beweiding van lusern deur volstruise teenoor hooiproduksie. 1974. D.J. Beukes, J.E. Wicht

SIEKTES/DISEASES

- (A)PS-Pr.58: Diseases of pasture crops in South Africa:
 58/1: - A survey of lucerne diseases in South Africa. 1978. A.H. Thompson

TELING/BREEDING

- K-Gf.10: Teling van lusern. 1935. G.C. de Kock, B.A. Lötter

RYS/RICE

ONKRUIDBESTRYDING/WEED CONTROL

- T-Bt.13: Rysverbouing in die Oos-Transvaalse Laeveld:
 13/1: - Chemiese onkruidbeheer. 1967. M.C. Dippenaar

SIGOREI/CHICORY

CULTIVARS

- OK-Bh.7: Sigorei in die Oos-Kaap:
 7/2: - Cultivars. 1974. A.A. Römer, J.D. Aucamp

ONKRUIDDODERS/HERBICIDES

- OK-Bh.7: Sigorei in die Oos-Kaap:
 7/4: - Onkruiddoders. 1974. J.D. Aucamp

SAADPRODUKSIE/SEED PRODUCTION

- OK-Bh.7: Sigorei in die Oos-Kaap:
 7/3: - Saadproduksie. 1974. J.D. Aucamp

PHORMIUM TENAX

PRODUKSIE/PRODUCTION

- N-Ce.83: *Phormium tenax* production in the Natal Region:
 83/8: - Effect of fertilization and weed control on the yield of an existing *Phormium* plantation. 1970. R.D. Mould

SISAL

BEMESTING/FERTILIZERS

- N-Ce.86: Sisal production in the Natal Region:
 *86/2 - Fertilizer and plant population study. 1966. R.D. Mould

PRODUKSIE/PRODUCTION

- *N-Ce.86/1: Effect of severity, regularity and stage of commencement of cutting on the yield of sisal. 1964. R.D. Mould

ALGEMEEN/GENERAL

CULTIVARS

- H-Ps.86: Research in connection with new introductions and crops not included in other projects. 1955. D.J. Crafford, C.J. Swanevelder
 SG.20: Veredeling en verbouwing van mannas:
 20/1: - Babalacultivars vir graanproduksie. 1977. J.J. Coetzee

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.97: Afbreking en vermindering van plaagbeheermiddelreste:
 97/5: - Nabywing van insekdoders in opgebergde graan. 1973. P.R. de Beer, J.H. Viljoen
 (A)I-Pr.134: Studie van die voorkoms, aard en omgewing van insekmiddelbestandheid by die belangrikste plaaginsekte van opgebergde graan in S.A.:
 134/1: - Insekmiddelbestandheid by *Tribolium* spesies. 1975. J.H. Viljoen

PRODUKSIE/PRODUCTION

- SW-Uk.4: Droëlandse gewasproduksie in die noorde van Suidwes-Afrika:
 4/1: - Aanpasbaarheid van somergewasse in die duineveld van Grootfontein. 1973. H.C. Hugo, J. van der Sandt

TUINBOU/HORTICULTURE

Groente/Vegetables

TAMATIES/TOMATOES

CULTIVARS

- (A)T-Rp.148/2: Evaluasie van tamatiecultivars in die verskillende produksiegebiede:
 148/2/1: - Marktamaties. 1975. A.S.A. Oosthuizen, S.E. Bosch, C. L. Bester, J.J. Wagner, W.D. Going, P.F. Nortjé

- 148/2/2: - Inmaaktamaties. 1975. A.S.A. Oosthuizen, S.E. Bosch, C. L. Bester, J.J. Wagner, W.D. Going

INSEKTEPLAE/INSECT PESTS

- (A)T-Rp.148/6: Verhoging van die potensiaal van tamatieproduksie in Suid-Afrika: Plaagbeheerstudies -
- 148/6/1: - Insekodertoetse en diagnostiese ondersoek en evaluasie van onbekende plaë. 1975. C.C. Daiber

ONKRUIDBESTRYDING/WEED CONTROL

- (A)T-Rp.148/3: Verhoging van tamatieproduksie in Suid-Afrika: Verbouingstudies met tamaties -
- 148/3/4: - Onkruidbeheerstudies. 1975. A.S.A. Oosthuizen

SIEKTES/DISEASES

- (A)T-Rp.148/5: Verhoging van die potensiaal van tamatieproduksie in Suid-Afrika: Siektebeheerstudies -
- 148/5/1: - Swamodertoetse en diagnostiese ondersoek van die oorsake van onbekende siekteverskynsels by tamaties. 1975. B.H. Boelema, S. Visser
- 148/5/2: - Toets van *Lycopersicon*-plantmateriaal vir bestandheid teen bakteriese kanker. 1975. B.H. Boelema
- 148/5/3: - Kwantitatiewe ondersoek na die epidemiologie van *Verticillium*-verwelksiekte by tamaties. 1975. S. Visser

TELING/BREEDING

- (A)T-Rp.148/1: Teling en seleksie van tamaties:
- 148/1/1: - Marktamaties. 1975. A. Louw, A.S.A. Oosthuizen, S.E. Bosch, J.J.B. van Zijl
- 148/1/2: - Inmaaktamaties. 1975. A. Louw, A.S.A. Oosthuizen, S.E. Bosch, J.J.B. van Zijl, B.H. Boelema, S. Visser, C.L. Bester

VERBOUINGSPRAKTYKE/CULTURAL PRACTICES

- (A)T-Rp.148: Verhoging van die potensiaal van tamatieproduksie in Suid-Afrika: Verbouingspraktyke -
- 148/3/1: - Produksie onder beskerming. 1973. A.S.A. Oosthuizen, A.G. Comrie
- 148/3/2: - Manipulasie van die gewas. 1975. A.S.A. Oosthuizen
- 148/3/3: - Wisselboustudies. 1975. O.J. Olivier, P.J. Henrico, S. Visser

VOEDINGSTATUS/NUTRITIONAL STATUS

- (A)T-Rp.148: Increasing the potential of tomato production in South Africa:
- 148/4: - Establishing criteria for assessing the normal nutritional status of tomatoes. 1975

BLOMKOOL/CAULIFLOWER

CULTIVARS

- (A)T-Rp.153/2: Verhoging van die produksiepotensiaal van koolgewasse in Suid-Afrika:
 153/2/1: - Blomkool. 1975. A.F. Coertze, C.E. Rappard, A.G. Comrie, P.F. Nortjé, S.E. Bosch, J.J. Wagner

TELING/BREEDING

- (A)T-Rp.153/1: Teling en seleksie:
 153/1/1: - Blomkool. 1975. A.F. Coertze

KOPKOOL/CABBAGE

CULTIVARS

- (A)T-Rp.153/2: Verhoging van die produksiepotensiaal van koolgewasse in Suid-Afrika:
 Evaluasie in die verskillende produksiegebiede -
 153/2/2: - Kopkool. 1975. P.J. Henrico, A.G. Comrie, P.F. Nortjé, J.J. Wagner, S.E. Bosch, P.F. Nortjé, J.J. Wagner

INSEKTEPLAE/INSECT PESTS

- (A)I-Pr.97: Afbreking en vermindering van plaagbeheermiddelreste:
 97/2: - Vermindering van plaagbeheermiddels op kool. 1973. Mareli Krause

UIE/ONIONS

CULTIVARS

- (A)T-Rp.157/2: Verhoging van die potensiaal van bolgroentes:
 157/2/1: - Evaluasie van uie in die verskillende produksiegebiede. 1976. T.G. la G. Joubert, P.J. Henrico, P.F. Nortjé, S.E. Bosch, J.J.B. van Zijl, J.J. Wagner, O.J. Olivier

SAADPRODUKSIE/SEED PRODUCTION

- W-Vl.17: Produksie van groentesaad:
 *17/22: - Koöperatiewe proef om verskillende produksietegnieke van uiesaadproduksie uit te toets. 1976. B.F.A. Visser

SIEKTES/DISEASES

- (A)PS-Pr.41: Studies of seed-borne fungi and seed-borne fungus diseases and their control in South Africa:
 41/1: - Fungus flora of onion seed. 1973. G.C.A. van der Westhuizen

VEREDELING/IMPROVEMENT

- (A)T-Rp.157: Verhoging van die potensiaal van bolgroentes:
 157/1: - Veredeling en seleksie van uie. 1976. T.G. la G. Joubert, J.J.B. van Zijl

PATATS/SWEET POTATOES

CULTIVARS

- (A)T-Rp.152: Verhoging van die produksiepotensiaal van wortelagtige gewasse in Suid-Afrika:
 Evaluasie van wortelagtige gewasse in die verskillende produksiegebiede -
 152/2/1: - Patats. 1976. S.E. Bosch, J.J. Wagner, C.L. Bester, T.G. la G. Joubert, C.E. Rappard, P.F. Nortjé

TELING/BREEDING

- (A)T-Rp.152/1: Teling en seleksie:
 152/1/1: - Patats. 1975. T.G. la G. Joubert

VOEDINGSTATUS/NUTRITIONAL STATUS

- (A)T-Rp.152/3: Grond, voeding en bemesting:
 152/3/1: - Patats. 1975.

BOONTJIES/BEANS

CULTIVARS

- (A)T-Rp.155/2: Verhoging van die potensiaal van groenboonproduksie in Suid-Afrika:
 155/2/1: - Evaluasie van die verskillende produksiegebiede. 1975. A.F. Coertze, A.G. Comrie, J.J. Wagner, P.F. Nortjé, S.E. Bosch

SIEKTES/DISEASES

- (A)T-Pr.155/4: Verhoging van die produksiepotensiaal van groenbone in Suid-Afrika:
 Siektebeheerstudies -
 155/4/1: - Toets van boontjiecultivars vir bestandheid teen vetvleksierte. 1975. B.H. Boelema

TELING/BREEDING

- (A)T-Rp.155/1: Teling en seleksie van groenbone in Suid-Afrika:
 155/1/1: - Teling en seleksie van groenbone vir prosesseringsdoeleindes. 1975. A.F. Coertze

VERBOUING/CULTIVATION

- (A)T-Rp.155/3: Verhoging van die potensiaal van groenboonproduksie in Suid-Afrika:
 155/3/1: - Spasieringsproewe met stambone. 1975. A.F. Coertze

ERTJIES/PEAS

BESPROEING/IRRIGATION

- (A)T-Rp.110: Waterverbruik en besproeiing van groenerte. 1967. O.J. Olivier

TELING/BREEDING

- (A)T-Rp.154: Verhoging van die produksiepotensiaal van groenerte in Suid-Afrika:
 154/1: - Teling. 1976. J.A. van Blommestein

- 154/2: - Waardebepaling van groenertcultivars en teellyne. 1975. J.A. van Blommenstein, A.G. Comrie, C.E. Rappard, J.J. Wagner, W.D. Going

RANKGEWASSE/CUCURBITS

EVALUASIE/EVALUATION

- (A)T-Rp.156/2: Verhoging van die potensiaal van rankgewasproduksie:
Evaluasie in die verskillende produksiegebiede -
156/2/1: - Spanspekke en waatlemoene. 1976. J.J.B. van Zijl, C.L. Bester

SIEKTES/DISEASES

- (A)T-Bt.6: Mosaïekvirsuse by pampoengewasse in die Transvaalse Laeveld:
6/1: - Biologie en ekologie van die vektorplantluise. 1973. E.G. Eulitz

TELING/BREEDING

- (A)T-Rp.156/1: Verhoging van die potensiaal van rankgewasproduksie:
Teling en seleksie -
156/1/1: - Spanspekke. 1976. J.J.B. van Zijl
156/1/2: - Pampoene en skorsies. 1976. J.A. van Blommenstein

VERBOUING/CULTIVATION

- (A)T-Rp.63: Verbouingstudies met pampoengewasse. 1959. O.J. Olivier

Diverse Groente/Sundry Vegetables

CRUCIFERAE

SIEKTES/DISEASES

- N-Ce.140: Control of diseases of Cruciferae in Natal Region:
140/2: - Control of *Cercospora Cercolsporella* leaf blight of Japanese radish. 1978. A.S. Hall

KNOFFEL/GARLIC

VERBOUING/CULTIVATION

- (A)T-Rp.141: Verbouingstudies met knoffel. 1972. O.J. Olivier, P.J. Henrico

ALGEMEEN/GENERAL

NEMATODES

- (A)I-Pr.115: Bioëkologie en bestryding van die aartappelsistaalwurm *Heterodera rostochiensis* en die beetsistaalwurm *Heterodera schachtii* in Suid-Afrika:

- *115/2: - Onderzoek na die ekonomiese belangrikheid, biologie, ekologie en beheer van die beetsistaalwurm *Heterodera schachtii* in Suid-Afrika. 1972. Valerie H. Meaton

SAADINSTANDHOUDING/SEED MAINTENANCE

- (A)T-Rp.160: Instandhouding en produksie van verbeterde voortplantingsmateriaal en teler- of basissaad van groentegewasse:
- 160/1: - Produksie en instandhouding van virusgetoetste groentecultivars. 1975. P.J. Klessner, D.D. Nel, E.J.S. du Plessis, C.W. Roux
- 160/2: - Instandhouding van teler- of basissaad van groentegewasse. 1975. T.G. la G. Joubert, C.H. Weber, C.W. Roux

Blomme, Sierplante en Kruie/Flowers, Ornamentals and Herbs

BLOMPLANTE/FLOWERING PLANTS

MIDDELS/REMEDIES

- (A)T-Rp.158/1: Verhoging van produksiepotensiaal van blom- en sierplante:
Siektebeheerstudies -
- 158/1/1: - Diagnostiese ondersoek na nuwe swam- en bakteriedoders by sier- en blomplante. 1975. B.H. Boelema, S. Visser
- (A)T-Rp.158/2: Verhoging van die produksiepotensiaal van blom- en sierplante vir snyblomme, sowel as sierplante vir tuine in Suid-Afrika:
Plagbeheerstudies -
- 158/2/1: - Diagnostiese ondersoek na plae en evaluering van beheermiddels. 1976. M.C. Bolton

ONKRUIDDODERS/HERBICIDES

- (A)T-Rp.111: Evaluering van nuwe onkruidodders by tuinbougewasse:
- 111/1: - Evaluering van nuwe onkruidodders by blomme. 1967

INSEKTEMIDDELS/INSECTICIDES

- (A)T-Rp.150/3: Plagbeheerstudies by blomplante:
- 150/3/1: - Diagnostiese ondersoek na nuwe plae en waardebepalings van nuwe insekmiddels by blomplante. 1975. C.C. Daiber

LACHENALIA, ORNITHOGALUM & GLADIOLUS

- (A)T-Rp.150/1: Verhoging van die produksiepotensiaal van blomplante:
- 150/1/1: - Veredeling van die genus *Lachenalia*. 1975. J. Lubbinge
- 150/1/2: - Veredeling van die genus *Ornithogalum*. 1975. J. Lubbinge
- 150/1/3: - Veredeling van die genus *Gladiolus*. 1975. J. Lubbinge
- 150/2/1: - Gewaskundige manipulasie van *Ornithogalum* om die blom- en groeiperiode te verander. 1979. D.I. Ferreira

SIEKTES/DISEASES

(A)T-Rp.150/4: Beheerstudies by blombolplante:

150/4/1: - Diagnostiese ondersoek na en waardebeepaling van nuwe middels by blombolplante. 1975. B.H. Boelema, S. Visser

150/4/2: - Studie van virussiektes by blombolplante. 1975. Patricia Klesser, D.D. Nel

VIROLOGIE/VIROLOGY

(A)T-Rp.159: To maintain and multiply improved plant material:

159/1: - Production, re-indexing and maintenance of virus tested clones of flowering plants. 1976. Patricia Klesser, D.D. Nel, E.J.S. du Plessis, C.W. Roux

POTPLANTE/POT PLANTS

ONTWIKKELING/DEVELOPMENT

(A)T-Rp.151/1: Development and improvement of certain species of flowering plants for use as pot plants:

151/1/5: - Various plants indigenous to South Africa. 1975. H.L. Pearse

ROSE/ROSES

SIEKTES/DISEASES

(A)T-Rp.158/1: Verhoging van die produksiepotensiaal van blom- en sierplante:
Siektebeheerstudies -

158/1/2 - Ondersoek na die simptome en ontwikkeling van verticillium-verwelksiekte by rose soos dit onder plaaslike toestande voorkom en die moontlike beheer daarvan. 1976. S. Visser

VERBOUING/CULTIVATION

(A)T-Rp.158: Verbouingstudies met rose:

158/3: - Affiniteitstudies met rose, 1979, D.I. Ferreira

158/4: - Opberging en na-oes-fisiologiese studies met rose. 1979. D.I. Ferreira

PROTEAS

CULTIVARS

(A)T-Rp.149: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:

149/6: - Registrasie en evaluasie van nuwe cultivars vir vrystelling aan die bedryf. 1975. G.J. Brits, M.N. van Niekerk

IDENTIFISERING/IDENTIFICATION

(A)T-Rp.149/1: Identifisering en beskrywing van Proteaceae-spesies vir die bedryf en vir navorsing. 1975. G.J. Brits

PLAAGBEHEER/PEST CONTROL

- (A)T-Rp.149: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:
149/7: - Beheer van plaë by verboude proteas. 1977. C. Kok

TELING/BREEDING

- (A)T-Rp.149: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:
149/5: - Veredeling. 1975. G.J. Brits, M.N. van Niekerk

VERBOUING/CULTIVATION

- (A)T-Rp.149: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:
149/4: - Boordverbouing. 1977. G.J. Brits, M.N. van Niekerk, P. van den Bergh

VERSAMELING/COLLECTION

- (A)T-Rp.149: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:
149/2: - Proteaceae-versameling, vestiging en instandhouding van navorsingsmateriaal.
1975. M.N. van Niekerk, G.J. Brits, P.N. van den Bergh

VOORTPLANTING/REPRODUCTION

- (A)T-Rp.149/3: Ontwikkeling van Proteaceae as kommersiële snyblomme in Suid-Afrika:
Voortplantingstudies -
149/3/1: - Vegetatiewe studies. 1975. G.J. Brits, M.N. van Niekerk
149/3/2: - Voortplanting deur saad en diverse metodes. 1975. G.J. Brits, M.N. van Niekerk

KRUIE/HERBS

ALGEMEEN/GENERAL

- *(A)T-Rp.159/2: Instandhouding van versamelings van kruie, medisinale plante en plante met vlugtige
olies. 1975. P.N. van den Bergh

ALGEMEEN/GENERAL

KIEMPLASMA/GERM PLASM

- (A)T-Rp.159: To maintain and multiply improved plant material:
159/1: - Produksie, herindeksering en instandhouding van virusgetoetste klone. 1975. P.J.
Klessner, D.D. Nel, E.J.S. du Plessis, C.W. Roux
*159/3: - Maintenance of collection of flowers and shrubs for research purposes and
functional utilization of ornamental plants in a garden design surrounding an
extensive building complex. 1976. C.W. Roux

Kern- en Steenvrugte/Pome and Stone Fruit

APPELS/APPLES

BESPROEING/IRRIGATION

- (S)WP.254: Waterbehoefte van tafeldruiwe, kern- en steenvrugte:

- 254/4: - Effek van oorhoofse verkoeling op die groei, opbrengs, vrugtekwiteit en waterverbruik van appelbome. 1979. F.C. van Rooyen

BIOCHEMIE/BIOCHEMISTRY

- (S)WP.172: Bitterpit by appels:
- 172/5: - Ontwikkeling van 'n metode om die intensiteit van bitterpit te voorspel. 1971. J.H. Terblanche
- 172/7: - Invloed van groeireguleerders op die voorkoms van bitterpit. 1976. J. Steenkamp
- 172/10: - Faktore wat die opname van kalsium-45 deur appelvrugte beïnvloed. 1975. A.N. Hanekom
- 172/11: - Na-oes-kalsium-doopbehandelings vir beheer van bitterpit. 1976. G.J. Eksteen
- 172/13: - Na-oes-voorspelling van bitterpit. 1976. G.J. Eksteen
- (S)WP.232: Pome fruits: Harvest and post-harvest fruit physiology:
- 232/1: - Maturity indices for apples. 1978. H. Tormann, T.R. Visagie

CULTIVARS

- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/10: - Appelcultivars en -seleksies. 1971. J.D. Stadler
- (S)WP.178: Aanplanting en instandhouding van bestaande en nuwe cultivars en onderstamme van kern- en steenvrugte, neute, bessies en olywe: Appelcultivars. 1970. J.V. Hadlow
- (S)WP.249: Kernvrugte: Evaluasie van cultivars, seleksies en onderstamme:
- 249/7: - Evaluasie van Starking-tipe appels. 1978. P.R. Jolly
- 249/8: - Evaluasie van Golden Delicious-tipe appels. 1979. P.R. Jolly

INSEKTEPLAE/INSECT PESTS

- (S)WP.234: Pome fruits: Chemical and physical control of pests:
- 234/3: - Chemical control of snoutbeetles in apple orchards. 1977. B.N. Barnes, P.L. Swart
- (S)WP.236: Pome fruits: Bionomics and ecology of pests:
- *236/1: - Development of a system for monitoring snoutbeetle populations in apple orchards. 1978. B.N. Barnes, P.L. Swart
- 236/2: - Rearing leafrollers in the laboratory. 1977. T.L. Blomefield

OESBEHEER/CROP CONTROL

- (S)WP.168: Oesbeheer by bladwisselende vrugtebome:
- 168/4: - Vergelyking van die ope senter (kelk)-, palmet- en piramiedopleistels by appels en die vasstelling van die beste plaaslike plantafstande vir palmet en piramied. 1969. J.D. Stadler, O. Bergh
- 168/10: - Snoeimetodes vir nougeplante appelboorde. 1972. O. Bergh
- 168/12: - Vergelyking tussen die ope senter (kelk)-, piramied-, vrye spil- en slanke spilopleistels by verskillende appelcultivars op dwergende en semidwergende onderstamme. 1972. O. Bergh

ONDERSTAMME/ROOTSTOCKS

- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/14: - Ingevoerde appelonderstamme. 1971. O. Bergh

OPBERGING/STORAGE

- (S)WP.247: Invloed van vooroes- en verkoelingsfaktore op hou vermoë:
- 247/3: - Identifisering van faktore wat kneusings by Golden Delicious-appels induseer. 1979. G.J. Eksteen

SIEKTES/DISEASES

- (S)WP.189: Voorkoms en beheer van na-oes-bederfsiektes by tafeldruiwe, kern- en steenvrugte:
- 189/6: - Kernverrotting by Starking-appels. 1979. J. Combrink
- (S)WP.241: Fisiologiese kwale van tafeldruiwe, kern- en steenvrugte:
- 241/4: - Rol van organiese sure by die inbeweging en vaslegging van kalsium by appels. 1978. J. Steenkamp
- (S)WP.255: Opname en translokasie van voedingselemente by tafeldruiwe, kern- en steenvrugte:
- 255/2: - Factors affecting the immobilisation of calcium in apple trees. 1977. L.G. Wooldridge
- (S)WP.256: Fusikladiumsiekte van appels:
- 256/1: - Development of an apple scab warning service. 1972. W.F.S. Schwabe

TEGNOLOGIE/TECHNOLOGY

- (S)WP.238: Kernvrugte: Verwerking:
- 238/1: - Appelversnaperings. 1978. C.F. Hansmann
- 238/2: - Appel drank. 1978. J.F. du T. Hugo

TELING/BREEDING

- (S)WP.227: Teel van verbeterde appelcultivars:
- 227/1: - Teel van 'n laat rooi appelcultivar. 1977. N. Hurter, M.J. van Tonder
- 227/2: - Teel van cultivars wat teen skurfsiekte bestand is. 1977. N. Hurter, M.J. van Tonder
- 227/3: - Teel van 'n Granny Smith-tipe met 'n kompakte groeiwyse. 1978. N. Hurter, M.J. van Tonder
- 227/4: - Ontwikkeling van weefselkultuurtegnieke met die oog op mutasieteelt by appels. 1978. Rachel E. Pieterse
- 227/7: - Teel van appelcultivars met 'n kompakte groeiwyse. 1978. N. Hurter

PERE/PEARS

CULTIVARS

- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/4: - Peeronderstamme. 1971. H.J. van Zyl
- 166/12: - Peercultivars en -seleksies. 1971. J.V. Hadlow, J.D. Stadler
- (S)WP.178: Aanplanting en instandhouding van bestaande en nuwe cultivars en onderstamme van kern- en steenvrugte, neute, bessies en olywe:
- 178/2: - Peercultivars. 1970. J.W. Etsebeth

FISIOLOGIE/PHYSIOLOGY

- (S)WP.239: Kernvrugte: Fisiologie van groei en ontwikkeling:
- 239/2: - Fisiologie van beworteling van BP2-peeronderstam van hardehoutsteggies. 1978. P. van Huyssteen

OESBEHEER/CROP CONTROL

- (S)WP.168: Oesbeheer by bladwisselende vrugtebome:
- 168/16: - Vergelyking van die piramied-, palmet- en kelkopleistelsels by verskillende plantafstande vir Packham's Triumph, Doyenne du Comice en Bon Chrétien op kweper A-onderstamme. 1974. H.J. van Zyl
- 168/17: - Vrugsetstudies met Packham's Triumph-pere. 1974. H.J. van Zyl
- 168/18: - Verhoging van produksie. 1977. H.J. van Zyl

PRODUKSIE/PRODUCTION

- (A)T-Rp.161/3: Verhoging van die potensiaal van perskeproduksie in die somerreëgebied:
- 161/3/2: - Optimale plantafstande van perskes en verbouingspraktyke in hoë digtheidsplantsisteme. 1978. T. Haulik

TEGNOLOGIE/TECHNOLOGY

- (S)WP.238: Kernvrugte: Verwerking:
- 238/3: - Verwerking van peerafval. 1978. C.P. Hansman
- 238/4: - Tekstuur van ingemaakte pere. 1978. J.A.G. van Rhyn

TELING/BREEDING

- (S)WP.226: Teel van verbeterde peercultivars:
- 226/1: - Teel van laat cultivars wat vroeg in drag kom. 1977. N. Hurter, P.F. Louw
- 226/2: - Teel van cultivars wat teen skurfsiekte bestand is. 1977. N. Hurter, P.F. Louw
- 226/3: - Teel van Packham's Triumph-tipe met 'n kompakte groeiwyse. 1977. N. Hurter, P.F. Louw

PERSKES/PEACHES

BESPROEING/IRRIGATION

- (A)T-Rp.161/3: Verhoging van die potensiaal van perskeproduksie in die somerreëgebied:
- Verbouingstudies -
- 161/3/1: - Besproeiingsbehoefte van perskes. 1975. T. Haulik, E.P. Evans

- 161/3/2: - Optimale plantafstande van perskes en verbouingspraktyke in hoë digtheidplantristeme. 1978. T. Haulik
- (S)WP.262: Waterbehoefte van perskes:
- 262/1: - Lisimeterstudies oor besproeiingskudelering by perskes. 1979. F.C. van Rooyen

BIOCHEMIESE STUDIES/BIOCHEMICAL STUDIES

- (S)WP.175: Seisoensopname van voedingstowwe deur sagtevrugtebome en bessies:
- 175/4: - Seisoensopname van voedingstowwe en die seisoenspatroon vir die opbouing, opberging, mobilisasie en verbruik van die koolhidraat- en stikstoffraksies by twee-jaar-oue Kakamas-perskebome gekweek in sandkultuur. 1974. P.J.C. Stassen

CULTIVARS

- (A)T-Rp.161: Perskeproduksie in die somerreëengebied:
- 161/2: Evaluasie van perskecultivars en teellyne in die verskillende produksiegebiede:
- 161/2/1: - Dessertperskes. 1975. E.P. Evans, K.G. Zwahlen, M.J. Slabbert
- 161/2/2: - Perskes vir prosesering (inmaak en droging). 1975. E.P. Evans, K.G. Zwahlen, M.J. Slabbert
- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/5: - Evaluering van onderstamme vir perskes. 1971. O. Bergh
- 166/8: - Perskecultivars en -seleksies. 1971. J.D. Stadler
- (S)WP.178: Aanplanting en instandhouding van bestaande en nuwe cultivars en onderstamme van kern- en steenvrugte, neute, bessies en olywe:
- 178/3: - Perskecultivars. 1970. J.W. Etsebeth

INSEKTEPLAE/INSECT PESTS

- (A)T-Rp.161/4: Verhoging van die potensiaal van perskeproduksie in die somerreëengebied: Plaagbeheerstudies -
- 161/4/1: - Die biologie van en 'n ekologiese opname van valskodlingmot in perskeboorde. 1975. C.C. Daiber
- (S)WP.233: Stone fruits: Bionomics and ecology of pests:
- 233/1: - Development of a monitoring system for false codling moth populations in peach orchards. 1977. T.L. Blomefield, K.L. Pringle

OESBEHEER/CROP CONTROL

- (S)WP.168: Oesbeheer by bladwisselende vrugtebome:
- 168/11: - Snoei van Kakamastipe perskebome vir die verkryging van kleiner bome, 'n vroeër drag en langer produktiewe leeftyd. 1972. O. Bergh

TEGNOLOGIE/TECHNOLOGY

- (S)WP.237: Steenvrugte: Verwerking:
- 237/3: - Droging van Elberta-perskes. 1978. G.L. Wium
- 237/4: - Simulasie van sondroging van perskes. 1978. G.L. Wium

TELING/BREEDING

- (A)T-Rp.161: Perskeproduksie in die somerreëng gebied:
- 161/1: - Teling en seleksie. 1975. P.M. Erasmus, M.J. Slabbert, E.P. Evans
- (S)WP.186: Teling van nuwe perskecultivars:
- 186/1: - Teling van nuwe inmaakperskecultivars. 1971. W.G. Wenzel
- 186/2: - Teling van nuwe geel vleis cultivars vir dessert- en droogdoeleindes. 1971. W.G. Wenzel
- 186/3: - Mutasieteel met kaalperskes aan die hand van bestraling. 1979. P.F. Louw

VERBOUING/CULTIVATION

- (A)T-Rp.161: Verhoging van die potensiaal van perskeproduksie in die somerreëng gebied:
- 161/3: - Verbouing studies. 1976. T. Haulik

PRUIME/PLUMS

BIOCHEMIE/BIOCHEMISTRY

- (S)WP.197: Studies oor rypwording by sagte vrugte en tafeldruie:
- 197/1: - Metodes om rypheidsgraad van pruime te bepaal. 1971. H. Tormann

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- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/17: - Pruimcultivars en seleksies. 1971. J.D. Stadler
- (S)WP.178: Aanplanting en instandhouding van bestaande en nuwe cultivars en onderstamme van kern- en steenvrugte, neute, bessies en olywe:
- 178/5: - Pruim- en pruimedantcultivars. 1970. J.W. Etsebeth

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- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/9: - Onderstamme vir pruime. 1971. P.C.J. Stassen, H.J. van Zyl

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- (S)WP.257: Siektes van pruime:
- 257/5: - Infeksie en vrystelling van *Xanthomonas pruni* in pruimbome. 1980. H.J. du Plessis

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- (S)WP.158: Breeding new plum cultivars:
- *158/2: - Breeding research at the polyploid level. 1965. N. Hurter
- 158/3: - Mutation breeding. 1965. N. Hurter

- 158/4: - Teling vir bestandheid teen bakteriese vlek (*Xanthomonas pruni*). 1972. M.J. van Tonder
- (S)WP.162: Breeding new plum rootstock types:
- 162/3: - Assessment of rootstocks. 1965. N. Hurter
- 162/4: - Fase 2-evaluasie van nege plaaslik geselekteerde pruimonderstamme. 1980. N. Hurter

VERBOUINGSPRAKTYKE/CULTIVATION PRACTICES

- (A)S-Pr.58: Verbetering van mikroklimaat:
- 58/4: - Hoë palmetstelsels as windskatte vir pruime. 1977. G.K. Viljoen, P.R. Jolly
- (S)WP.168: Oesbeheer by bladwisselende vrugtebome:
- 168/15: - Vergelyking van die palmet- en kelkvorm van oplei vir Santa Rosa, Gaviota, Kelsey en Songold pruimcultivars. 1973. O. Bergh

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- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neut:
- 166/11: - Appelkooscultivars en -seleksies. 1971. C.W.J. Bester, J.D. Stadler
- (S)WP.178: Aanplanting en instandhouding van bestaande en nuwe cultivars en onderstamme van kern- en steenvrugte, neut, bessies en olywe:
- 178/4: - Appelkooscultivars. 1970. H.J. Walters

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- (S)WP.207: Kwaliteitstudies:
- 207/9: - Rypheidstandaarde en rypmaak van Bulida-appelkose vir inmaakdoeleindes. 1976. T.R. Visagie

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- (S)WP.251: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neut:
- 251/10: - Onderstamme vir appelkose. 1971. P.J.C. Stassen

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- (A)T-Rp.163: Verhoging van die potensiaal van neut-, bessie- en ander minder belangrike sagtevrugsoorte in die somerreëng gebied:
- 163/3: - Appelkose. 1976. T. Haulik

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- (S)WP.237: Steenvrugte: Verwerking:
- 237/5: - Samestelling en drogingseienskappe van appelkose. 1979. Marie-Lena Windt

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- (A)T-Rp.163/3: Appelkose:
 163/3/1: - Teling en seleksie van nuwe cultivars. 1976. T. Haulik
- (S)WP.228: Teel van verbeterde appelkooscultivars:
 228/1: - Teel van vroeë inmaakcultivars. 1977. N. Hurter, P.J.L. Ellis
 228/2: - Teel van cultivars geskik vir droging. 1977. N. Hurter, P.J.L. Ellis
 228/3: - Mutasieteel. 1977. N. Hurter, P.J.L. Ellis

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- (A)T-Rp.164/2: Kersieproduksie in die somerreëgebied:
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 164/2/1: - Evaluering van kersie-onderstamcultivars. 1975. K.G. Zwahlen
 164/2/2: - Evaluasie van soetkersiecultivars. 1975. K.G. Zwahlen

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- (A)T-Rp.164/1: Kersieproduksie in die somerreëgebied:
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 164/1/1: - Voortplantingstudies. 1975. K.G. Zwahlen
- (S)WP.242: Allerlei sagte en bessievrugte:
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 242/4: - Evaluasie van kersiecultivars in Wes-Kaapland en Langkloof. 1977. P.R. Jolly

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- (S)WP.229: Soil studies in connection with pome and stone fruit and table grape cultivation in the Winter Rainfall area:
 229/1: - Potassium supplying power of selected orchard soils. 1977. J. Woolridge

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- (S)WP.254: Waterbehoefte van tafeldruiwe, kern- en steenvrugte:
 254/1: - Effek van verskillende besproeiingskeduleringsbehandelings met behulp van die klas-D verdampingspan op die groei en opbrengs van vrugtebome. 1978. F.C. van Rooyen
 254/3: - Soil moisture distribution under drip irrigation in soils of the Western Cape. 1975. F.C. van Rooyen

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- (S)WP.232: Kernvrugte: Voor- en na-oes-vrugfisiologie. 1977

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- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
 166/18: - Tegniek vir die bepaling van natbestandheid van onderstamme vir steenvrugte. 1972. P.J.C. Stassen
- (S)WP.246: Steenvrugte: Voor- en na-oes-vrugfisiologie. 1978
- (S)WP.249: Kernvrugte: Evaluasie van cultivars, seleksies en onderstamme. 1978
- (S)WP.251: Steenvrugte: Evaluasie van cultivars, seleksies en onderstamme. 1978

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- (S)WP.243: Diverse toegewese gewasse: Verbouing in die winterreënvalgebied. 1978

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- (S)N.121: Valskodlingmotstudies:
 121/1: - Sterilisasie van valskodling mot, *Phlebia leucotreta*, deur gammabestraling. 1971. A. Schwartz, W.J. du Toit
- (S)WP.213: Na-oessterilisasie van uitvoersagtevrugte, -tafeldruiwe, -droëvrugte en ander toegewese uitvoergewasse om insek- en verwante plaagbesmettings te vernietig:
 213/2: - Sterilization by radiation of the fruit flies *Pterandrus rosa* and *Ceratitis capitata*. 1972. B.N. Barnes
- (S)WP.233: Steenvrugte: Bionomie en ekologie van plae. 1977
- (S)WP.234: Kernvrugte: Chemiese en fisiese beheer van plae:
 234/2: - Chemiese beheer van kodlingmot in kernvrugte. 1977. A.C. Myburgh
- (S)WP.235: Sagtevrugte: Na-oes-fitosanitiere beheermaatreëls vir plae. 1977
- (S)WP.236: Kernvrugte: Bionomie en ekologie van plae. 1977
 236/4: - Ecology and integrated control of the common red spider mite, *Tetranychus cinnabarinus*, and the European red mite, *Panonychus ulmi*. 1972. K.L. Pringle

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- (A)T-Rp.111: Evaluation of new herbicides for horticultural crops:
 111/2: - Evaluation of new herbicides for deciduous fruit and strawberries in the summer rainfall area. 1972

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- (S)WP.247: Kernvrugte: Invloed van vooroes- en voorverkoelingsfaktore op houervermoë.
- (S)WP.253: Koelopbergingsstudies in verband met tafeldruiwe, kern- en steenvrugte:
 253/1: - Invloed van gassamestelling op die houervermoë van appels tydens beheerde atmosfeeropberging. 1978. A.B. Truter

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- (S)WP.250: Kernvrugte: Produksiesisteme en oesbeheer. 1978
- (S)WP.252: Steenvrugte: Produksiesisteme en oesbeheer. 1978

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- (A)PS-Pr.39: Viruses and virus diseases of deciduous fruits (pome and stone):

- 39/1: - Detection and identification of viruses in pome and stone fruits. 1970. D.J. Engelbrecht
- (S)N.140: Tristeza virus complex:
- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/13: - Invloed van die virusstatus op die prestasie van Beurr Hardy, Packham's Triumph, Doyenne du Comice en Bon Chrétien-pere en Golden Delicious-appels. 1972. H.J. van Zyl
- (S)WP.189: Voorkoms en beheer van na-oes-bederfsiektes by tafeldruiwe, kern- en steenvrugte:
- 189/5: - Gebruik van chloor as ontsmettingsmiddel tydens waterhantering van appels. 1977. C.J. Combrink
- (S)WP.256: Kernvrugte: Etiologie en epidemiologie van bakteriese, swam- en virussiektes in boorde. 1978
- (S)WP.257: Steenvrugte: Etiologie en epidemiologie van bakteriese, swam- en virussiektes in boorde:
- 257/4: - Biotipes van *Agrobacterium tumefaciens* en *A. radiobacter* wat in Suid-Afrika voorkom. 1978. H.J. du Plessis, J.T. Loubser

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- (S)WP.151: Voedselskeikundige siektes:
- 151/3: - Samestelling van sagtevrugte. 1974. B.K. Nortjé
- (S)WP.195: Droging van vrugte en groente
- (S)WP.237: Steenvrugte: Verwerking. 1978
- (S)WP.238: Kernvrugte: Verwerking. 1978

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- (S)WP.246: Allerlei sagte- en bessievrugte: Teel van verbeterde cultivars. 1978. W.G. Wenzel

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- (S)WP.179: Water-, plant- en grondverhoudings:
- (S)WP.211: Voeding van bladwisselende vrugte en bessies:
- 211/6: - Uitwerking van verskillende grondbewerkingspraktyke op boomprestasie en fisiese en chemiese grondeienskappe. 1974. G.K. Schliemann

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- (S)WP.229: Grondkundige studies in verband met kern- en steenvrug- en tafeldruiwverbouing in die Winterreëgebied:
- 229/10: - Demonstrasiebemestingsproewe by vrugtebome: 1973. J.H. Terblanche
- (S)WP.255: Opname en translokasie van voedingselemente by tafeldruiwe, kern- en steenvrugte. 1978

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- (A)T-Rp.165: Instandhouding en produksie van verbeterde voortplantingsmateriaal van sagtevrugte en verwante gewasse:

- 165/1: - Produksie en instandhouding van virusgetoetste sagtevrugte-, tafeldruif- en ander vrugtecultivars. 1977. Patricia Klesser, D.D. Nel, E.J.S. du Plessis, C.W. Roux, K.G. Zwahlen

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- (S)WP.187: Aarbeiverbouing:
 187/3: - Evaluasie van arbeiseleksies. 1973. C.W.J. Bester
- (S)WP.242: Allerlei bessies en sagtevrugte:
 Verbouing in die winterreëgebied -
 242/5: - Planttyd en plantwydte van arbeicultivars. 1978. C.W.J. Bester
 242/6: - Verpakking en koelopberging van arbeiloperplante. 1978. C.W.J. Bester, A.B. Truter

TELING/BREEDING

- (A)T-Rp.163/2: Verhoging van die potensiaal van neut-, bessie- en ander minder belangrike sagtevrugsoorte in die somrreëgebied:
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 163/2/1: - Teling en seleksie van nuwe cultivars. 1976. E.P. Evans
- (S)WP.246: Teling van verbeterde arbeicultivars:
 246/2: - Benutting van die genetiese variasie op oktoploëde-vlak vir die ontwikkeling van cultivars geskik vir bevriesing, inmaak en uitvoer. 1972. W.G. Wenzel
 246/3: - Benutting van genetiese variasie by verwante en wilde vorms van die arbeie. 1972. W.G. Wenzel
 246/4: - Teel van bastearbeie. 1979. W.G. Wenzel

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- (S)WP.175: Seisoensopname van voedingstowwe deur sagtevrugte, bome en bessies:
 175/2: - Seisoensopname en verspreiding van tien essensiële voedingselemente (N, P, K, Ca, Mg, Mn, Fe, Cu, B en Zn) by die arbeicultivar Parfaite, gekweek in sandkultuur. 1972. J.H. Terblanche

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- (S)WI.45: Plantwydtes en stelsels van oplei vir Suid-Afrikaanse wyndruifwingerde:
 (S)WI.59: Vestiging en vernuwing van wingerd. 1977

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- (S)WI.51: Grond- en bemestingsstudies met wyndruiwe:
- 51/1: - NPK-bemestingsproef vir wingerd op droëland en onder besproeiing. 1964. D. Saayman
- 51/5: - Bemestingsproef met 'n Fransdruifwingerd (Lutzville). 1973. D. Saayman, G.J.J. Alberts
- 51/6: - Seisoensopname en verspreiding van tien voedingselemente by wingerdstokke gekweek in sandkultuur. 1974. W.J. Conradie
- 51/7: - Bemesting van wingerd: Studie van anorganiese en organiese bemestings op dupleksgrond, Stellenbosch. 1979. W.J. Conradie
- (S)WP.211: Voeding van bladwisselende vrugte en bessies:
- 211/1: - Bemesting van tafeldruiwe deur drup- en minispuitsbesproeiingstelsels. 1972. J.H. Terblanche

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- (S)WI.56: Besproeiing- en vogstudies by wingerd vir wyn- en drogingsdoeleindes:
- 56/1(K): - Waterbehoefte van Steendruiwe op Clovellygronde by Stellenbosch. 1973. J.L. van Zyl
- 56/2: - Invloed van differensiële besproeiingskedules en -metodes op die prestasie van Colombarddruie (Robertson). 1975. J.L. van Zyl
- 56/6: - Vergelykende evaluering van drup- en vloedsbesproeiing op verskillende bostok/onderstok-cultivarkombinasies. 1977. J.L. van Zyl
- (S)WP.254: Waterbehoefte van tafeldruiwe:
- *254/2: - Water-, plant- en grondverhoudings: Lisimeterstudies oor besproeiingskedulering. 1974. F.C. van Rooyen
- 254/5: - Invloed van verskillende vogregimes op die oesopopbrengs, kwaliteit en groei van Barlinkatafeldruiwe. 1979. F.C. van Royen

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- (S)WI.49: Studies oor die bewerking van wingerdgronde:
- 49/2: - Grondbewerkingstudies op Huttongrond in 'n besproeide Colombardwingerd (Lutzville). 1974. D. Saayman

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- (S)WP.147: Studies oor die rypwording en gepaardgaande metaboliese prosesse by tafeldruiwe:

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- (A)T-Rp.162: Tafeldruifproduksie in die somerreëgebied:
- 162/2: - Evaluasie van nuwe cultivars en teelne in die verskillende produksiegebiede. 1975. E.P. Evans, P.M. Erasmus
- (S)WI.43: Vergelykende evaluering van veredelde, nuutgeteelde of ingevoerde bostokcultivars:
- 43/1: - Visuele studies op kernaanplantings. 1964. W.J. Carstens
- 43/2: - Vergelyking van cultivars in veldproewe. 1964. W.J. Carstens
- 43/5: - Vergelyking van wyndruifcultivars in veldproewe op vier verskillende onderstokke op rivierslikgrond op Lutzvilleproefperseel No.101. 1970. W.J. Carstens

- 43/6: - Vergelyking van wyndruifcultivars in veldproewe op rooi sandgrond van die Olifantsriviergebied. (proefperseel Lutzville). 1972. W.J. Carstens
- 43/7(K): - Tussenplantingsproef met wit- en rooiwyndruifsoorte op Karoogrond by Vredendal. 1973. H.J. Schonken
- 43/8(K): - Tussenplantingsproef met witwyndruifsoorte op Dundeegrond by Goudini (Rawsonville). 1973. G.G. v.d. Merwe, E. Archer
- 43/9(K): - Tussenplantingsproef met rooiwyndruifsoorte op Sterkspruitgrondvorm in die Agter-Paarlgebied. 1973. E. Archer
- 43/10(K): - Tussenplantingsproef met witwyndruifsoorte op Huttongrond by Montagu. 1973. E. Archer
- 43/11: - Vergelyking van wyndruifcultivars op eie wortel in 'n veldproef op 'n Dundeegrondtipe van die Oudtshoornproefplaas. 1974. W.J. Carstens
- 43/12(K): - Tussenplantingsproef met rooiwyndruifcultivars op 'n Clovellygrondvorm in Durbanville. 1974. E. Archer
- Tussenplantingsproef met rooiwyndruifcultivars op 'n Clovellygrondvorm in die Breërivierwyk. 1974. E. Archer
- 43/15(K): - Tussenplantingsproef met wit- en rooiwyndruifcultivars op 'n Huttongrondvorm by Klawer. 1974. E. Archer
- 43/16(K): - Tussenplantingsproef met rooiwyndruifsoorte op 'n Clovellygrondvorm in Malmesbury. 1974. E. Archer
- 43/17(K): - Tussenplantingsproef met witwyndruifcultivars op 'n Dundeegrondvorm in Wolseley. 1974. E. Archer
- 43/18(K): - Tussenplantingsproef met witwyndruifcultivars op 'n Huttongrondvorm (Shorrocks) in Bonnievale. 1974. E. Archer
- 43/19(K): - Tussenplantingsproef met witwyndruifcultivars op 'n Dundeegrondvorm op Ladismith. 1974. E. Archer
- 43/20(K): - Tussenplantingsproef met rooiwyndruifcultivars op 'n Dundeegrondvorm op Ladismith (A. van der W. Bester, Buffelsdrift). 1974. E. Archer
- 43/21(K): - Tussenplantingsproef met rooiwyndruifcultivars op 'n Huttongrondvorm (Shigalo) in die Klein Karoo (P. Terblanche, Rietvlei, De Rust). 1974. E. Archer
- 43/22(K): - Tussenplantingsproef met witwyndruifcultivars op 'n Dundeegrondvorm in die Klein Karoo (B.D.L. Grundling, Sandkoppies, Wynandsrivier). 1974. E. Archer
- 43/23: - Evaluering van rooi- en witwyndruifcultivars op 'n Dundeegrondtipe in die Laer-Oranjegebied by Upington. 1975. E. Archer
- 43/25(K): - Tussenplantingsproef met rooi wyndruifcultivars op 'n Huttongrondvorm in Darling. 1976. E. Archer
- 43/27(K): - Tussenplantingsproef met wit- en rooi wyndruifcultivars op 'n Huttongrondvorm in die Barkly-Wes-omgewing. 1976. W.F. van der Westhuizen, C. Marincowitz
- 43/29: - Evaluering van bostokcultivars op die Vaalhartsnederstelling. 1973. W.F. van der Westhuizen
- 43/30: - Cultivarproef met wyn- en tafeldruifcultivars op 'n Oakleafgrondvorm in Cradock. 1977. W.J. van Heerden
- (S)WP.244: Tafeldruive: Evaluasie van cultivars, seleksies en onderstokke:
 - 244/4: - Seleksie van New Cross. 1969. E.W. Mostert
 - 244/5: - Seleksie van Almeria. 1969. E.W. Mostert
 - 244/6: - Seleksie van Golden Hill. 1973. J.F.D. le Roux

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- W-VI.17: Bevordering van landbouproduksie in die Winterreënstreek:
 17/35: - Wyndruiwe - ekonomiese norme. 1977. G.G. van der Merwe

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- (S)WI.75: Studie van translokasie deur die entlas om affiniteitsprobleme by wingerdenting op te spoor

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- (S)WP.220: Fisiologie van wortel- en kallusvorming by die wingerdstok. 1975. D.C. Uys
 (S)WP.230: Physiology of growth and development of table grapes:
 *230/1: - Effect of virus infection on the rate of photosynthesis and respiration of table grape vines. 1977. Helga Tormann
 (S)WP.241: Fisiologiese kwale van tafeldruiwe, kern- en steenvrugte. 1978

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- (S)WI.54: Grondvoorbereidingsstudies:
 54/1: - Invloed van grondvoorbereidingsdieptes en toevoegings van organiese materiaal op groei, produksie en kwaliteit van wyndruiwe. 1966. D. Saayman
 54/2: - Influence of soil preparation depths and additions of organic matter on growth production and quality of wine grapes (Robertson). 1976. D. Saayman
 54/3: - Invloed van grondvoorbereidingsmetodes en -dieptes asook bepaalde ameliorante op die grond en prestasie van wyndruiwe. 1977. L. van Huyssteen

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- (A)I-Pr.95: Biologie en beheer van die wingerdfilloksera (*Dactylosphaera vitifolii*):
 95/2: - Bestandheid van sekere onderstokke teen filloksera. 1964. C.A. de Klerk
 95/3: - Chemiese beheer van filloksera. 1972. C.A. de Klerk, P.C. Smith
 (A)I-Pr.127: Morfologie, biologie en beheer van wingerd-margarodes (Margarodidae Morr. en Termitococcidae Jak.) in Suid-Afrika. 1975. C.A. de Klerk
 (S)WI.39: Biologie en beheer van wingerdfilloksera:
 39/3(K): - Chemiese beheer met hexachlorobutadien in die Olifantsrivierbesproeiingsgebied. 1977. C.A. de Klerk
 39/4: - Ontwikkeling van metodes om die filloksera-weerstandbiedendheid van nuwe onderstokkruisings te bepaal. 1979. S. M. Norman
 (S)WI.70: Chemiese beheer van bogrondse insek- en ander plae van wyn- en droogdruiwe:
 70/1: - Beheer van die wingerdknopmyt. 1979. C.A. de Klerk
 (S)WP.235: Sagtevrugte: Na-oesfitosanitêre beheermaatreëls vir plae:
 235/2: - Kouesterilisasie
 (S)WP.259: Tafeldruiwe: Bionomie en ekologie van plae:
 259/1: - Uitwerking van plaagebeheermiddels op die ingevoerde witluisparasiet, *Anagyrus pseudococci*. 1978. E.A. de Kock
 (S)WP.260: Tafeldruiwe: Chemiese en fisiese beheer van plae:

- 260/1: - Chemical control of *Planococcus citri* on grapevines in the Hex River Valley. 1966. P.L. Swart, B.N. Barnes

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- (S)WI.42: Optimale oesladings van wyndruifcultivars. 1976
(S)WP.207: Kwaliteitsstudies:

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- (S)WI.23: Invloed van druifhantering, pars- en kelderprosedure op druif- en wyngelalte:
23/9: - Evaluasie van meganiese oes van wyndruiwe. 1976. H.J. Snyders
(S)WI.45: Plantwydtes en stelsels van oplei vir Suid-Afrikaanse wingerde:
45/7: - Ondersoek na oplei- en snoeipraktyke vir meganiese oes. 1976. A.S. Zeeman, H. Snyders

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- (A)I-Pr.96: Nematodes in South African vineyards:
96/3: - Response of established vineyards to nematocide treatment. 1972. P.C. Smith
96/4: - Transmission of grapevine virus diseases by nematode vectors. 1975. P.C. Smith

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- (S)WI.42: Optimale oesladings by wyndruifcultivars:
42/2: - Optimale oeslading van 'n rooi- en 'n witdruifcultivar in die Stellenbosch-omgewing. 1977. J.H. van der Westhuizen

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- (S)WI.46: Onderstokke vir Suid-Afrikaanse wingerde:
46/13: - Siftingsproef met onderstokke vir sultanas te Uppington. 1974. A. Calitz, W.J. Carstens
46/14: - Vergelykende studie met verskillende onderstoksoorte, met Steen as bostok, op 'n Dundee grondtipe op die Oudtshoornse proefplaas. 1974. W.J. Carstens
46/15(K): - Vergelykende studie van verskillende onderstoksoorte, met Steen as bostok, op 'n Dundeegrondtipe in die Montagu gebied. 1974. W.J. Carstens, B.C.H. Rix
46/16: - Affiniteitsproef met nuwe onderstokcultivars. 1975. A.H. Bergh, P.G. de Bruyn
46/17: - Vergelykende studie met verskillende onderstoksoorte met Clairette Blanche as bostok op 'n Huttongrondvorm. 1973. W.F. van der Westhuizen
46/18: - Invloed van grondsuurheid op die prestasie van verskillende onderstokke. 1976. W.J. Conradie

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- (S)WI.50: Chemiese onkruidbeheer in wyndruifwingerde:
50/1: - Fitotoksiteit van onkruidodders vir sekere druifcultivars. 1974. C.J. Smit
50/2: - Doeltreffendheid van onkruidodders. 1977. C.J. Smit

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- (S)WP.248: Tafeldruive: Invloed van vooroes- en voorverkoelingsfaktore op hou vermoë:
 *248/2: - Opberging in verseelde en geventileerde poliëtileenvoerings. 1978. J.C. Combrink
 248/3: - Invloed van verkoelingstempo's op kwaliteit van druive verpak in poliëtileensakke. 1978. J.C. Combrink
 248/4: - Influence of preharvest and precooling factors on keeping quality: Uptake of SO₂ by table grapes. 1978. Julianne C. László

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- (S)WP.264: Chemies/fisiese ontledings ten opsigte van droogdruive:
 264/1: - Samestelling van droogdruive na droging. 1980. C.F. Hansmann

OPLEISTELSELS/TRELLISING

- (S)W1.42: Invloed van verskillende oesladings op die groeikrag en wynkwaliteit van Chenin blanc by verskillende opleistels in die Robertson area. 1979. L.J. Jooste
 (S)W1.45: Plantwydtes en stelsels van oplei vir Suid-Afrikaanse wyndruifwingerde:
 45/5: - Sultanas en wyndruive in die Laer Oranjerivierstreek (Upington). 1970. A.S. Zeeman, A. Calitz
 (S)W1.56: Besproeiing- en vogstudies van wingerd vir wynmaak- en droogdoeleindes:
 56/4: - Invloed van opleistels en gepaardgaande mikroklimaat op die waterverbruik van 'n Chenin blanc wingerd. 1977. J.L. van Zyl

SIEKTES/DISEASES

- (A)PS-Pr.38: Viruses and virus diseases of the grapevine:
 38/1: - Detection and identification of viruses in the grapevine. 1970. D.J. Engelbrecht
 38/2: - Elimination of viruses in the grapevine. 1970. D.J. Engelbrecht
 (S)W1.33: Cultivarbestandheid teen bogrondse siektes van wingerd vir wyn- en droogdoeleindes:
 33/1: - Vinnige evaluasie van cultivarbestandheid teen nie-verpligte patogeen-botrytis. 1976. H.S. van der Walt
 33/2: - Vinnige evaluasie van cultivarbestandheid teen verpligte patogeen-oïddium. 1976. H.S. van der Walt.
 (S)W1.34: Ondergrondse swam- en bakteriesiektes by wyndruifwingerde:
 34/3: - Bepaling van die weerstandbiedendheid van wingerdonderstokke teen *Phytophthora*-wortelverrotting in veldproewe. 1975. P.G. Marais
 34/4: - Ondergrondse swam- en bakteriesiektes van wyndruifwingerde: Beheer van *Phytophthora* spp. in kwekerystokke en -gronde. 1977. P.G. Marais
 (S)W1.35: Onderzoek na die oorsake van en beheermaatreëls teen groeistilstandsiekte by sultanas:
 35/1: - Invloed van kaliumtoedienings, besproeiingsbehandelings en drag op die voorkoms van groeistilstandsiekte. 1973. D. Saayman
 35/2: - Bestudering van voedingstofopname en -translokasie deur middel van orgaan-analise. 1973. D. Saayman

- 35/5: - Invloed van bo- en ondergrondse temperature op die ontwikkeling van *Vitis*-cultivars onder beheerde toestande. 1976. L.J. Jooste
- (S)WI.38: - Chemiese beheer van bognondse siektes van wingerd vir wyn- en droogdoeleindes:
- 38/1: - Gesamentlike chemiese beheer van ekonomies belangrike bognondse swamsiektes in die Bolandkusgebied. 1976. P.G. Marais
- 38/2: - Gesamentlike chemiese beheer van ekonomies belangrike bognondse swamsiektes in die Oranjeriviergebied. 1976. P.G. Marais
- (S)WI.59: - Vestiging en vernuwing van wingerd:
- 59/1: - Vernuwing van 'n ou Cabernetwingerd. 1977. J. van Rensburg
- (S)WP.203: - Bakteriese siektes van sagtevrugte en tafeldruiwe:
- *203/3: - Bestudering van *Xanthomonas amperlina*, die oorsaaklike organisme van vlamsiekte by wingerd. 1972. J. Roberts
- (S)WP.258: - Tafeldruiwe: Chemiese en fisiese beheer van bakteriese, swam- en virussiektes in wingerde:
- 258/1: - Beheer van bederf veroorsaak deur *Botrytis cinerea*. 1972. F.N. Matthee, A.C. Thomas
- (S)WP.261: - Etiologie en epidemiologie van bakteriese, swam- en virussiektes in wingerde:
- 261/1: - Bepaling van oorlewingsbronne van *Botrytis cinerea* en die faktore wat spoorvrystelling beïnvloed. 1978. A.C. Thomas
- (S)WP.263: - Invloed van siektes op die voedingsbehoefte van tafeldruiwe:
- 263/1: - Invloed van virusbesmetting op die voedingsbehoefte van tafeldruiwe. 1979. J.F. de Villiers

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- (S)WI.67: - Invloed van winter- en somersnoei op stokprestasie:
- 67/1: - Snoeimetodes vir Cabernet Sauvignon. 1978. D.C. Morkel
- 67/2: - Suier van wyndruiwe. 1978. E. Archer

TELING/BREEDING

- (A)T-Rp.162: - Tafeldruifproduksie in die somerreënggebied:
- 162/1: - Teling en seleksie van verbeterde cultivars. 1975. E.P. Evans
- (S)WP.231: - Tafeldruiwe: Teel van verbeterde cultivars:
- 231/1: - Teel van 'n laat wit cultivar. 1977. N. Hurter, P.J.L. Ellis
- 231/2: - Teel van vroeë swart en wit tafeldruifcultivars. 1977. N. Hurter, P.J.L. Ellis
- 231/3: - Teel van een of meer nuwe pitlose cultivars. 1977. N. Hurter, P.J.L. Ellis

VOORTPLANTING/PROPAGATION

- (S)WI.41: - Verbetering van voortplantingsmateriaal vir Suid-Afrikaanse wingerde:
- 41/2: - Gebruik van kloneseleksie. 1965. W.J. Carstens
- 41/3: - Importation, propagation and investigation of new cultivars and clones. 1965. W.J. Carstens
- 41/4: - Tweedefase klone-evaluering van Colombar te Lutzville. 1974. W.J. Carstens

- 41/5: - Tweedefase klone-evaluering van Hanepoot te Lutzville. 1974. W.J. Carstens
 41/6: - Tweedefase evaluering van Steenklone te Nietvoorbij, Stellenbosch. 1974. W.J. Carstens
- (S)W1.44: Verbetering van ent- en kwekerypraktyke:
- 44/5: - Produksie van geënte stokke in kartonhouers - 'cartonage'. 1972. J.H. van der Westhuizen.

Wynkunde/Oenology

- (S)W1.14: Bepaling van die kwaliteit van wyndruiwe:
- 14/4: - Stadium van optimum rypheid. 1966. C.S. du Plessis
- (S)W1.20: Invloed van omgewingsfaktore op druif- en wyngetalte:
- 20/2: - Invloed van grondtipe op druif- en wyngetalte. 1973. P.H. Kleynhans
- (S)W1.22: Uitskakeling van ongewenste giste, bakterieë en swamme in mos en wyn
- (S)W1.23: Invloed van druifhantering, pars- en kelderprosedure op druif- en wyngetalte:
- 23/6: - Invloed van verskillende grade van vrot op wyngetalte. 1974. G.W.W. Wagener
- 23/8: - Bepalingsmetodes en invloed van fenole op wyngetalte. 1974. A. Tromp
- 23/12: - Evaluering van wynbereidingstoerusting. 1978. H.J. Snyders
- (S)W1.24: Reukstowwe en verwante komponente van brandewyn, wyn en druiwe:
- 24/2: - Invloed van bepaalde hoër vetsuuresters op gehalte van wyn. 1973. J. Marais
- 24/3: - Voorloperstowwe in druiwe van die etieloktoaat- en etieldekanoaatesters in wyne: 1975. M.C. Houtman
- (S)W1.28: Identifisering van kwaliteitskomponente in wyn:
- 28/1: - Siftingsproef vir die identifikasie van kwaliteitsfaktore in Chenin blanc druiwe. 1977. A.C. Houtman
- 28/2: - Evaluasie van die relatiewe bydraes van verskillende esters, hoër alkohole en vetsure tot die geur van wyn. 1978. C.A. van der Merwe
- (S)W1.30: Veroudering van wyn:
- 30/1: - Invloed van tyd, temperatuur en pH op sekere wynkomponente en wyngetalte. 1977. J. Marais
- (S)W1.36: Investigation of methods for decreasing sulphur dioxide in wines:
- 36/1: - Effect of temperature on wine yeast fermentation and metabolism with special reference to sulphur dioxide-binding metabolites. 1975. J. Laszlo
- 36/2: - Effect of dissolved oxygen and some antioxidative gases on SO₂ requirement of wines. 1976. J. Laszlo
- (S)W1.37: Verbetering van Suid-Afrikaanse wyngiste:
- 37/1: - Doeltreffende gebruik van gedroogde wyngis vir wynbereiding. 1975. W.A. Agenbach
- (S)W1.38: Chemiese beheer van bognondse siektes van wingerd vir wyn- en droogdoeleindes:
- 38/3: - Invloed van chemiese siektebeheermiddels op alkoholiese gisting en wynkwaliteit. 1976. W.A. Agenbach
- (S)W1.57: Korttermyn internasionale O.I.V. ondersoeke na die chemiese aspekte van die produkte van die wynstok. 1977. W. Zeeman
- (S)W1.66: Invloed van verskillende gistingstemperatuur op wyne van verskillende druifcultivars:

- 66/1: - Invloed van gistingstemperatuur op tydsduur van gisting, wynkwaliteit en -karakter. 1978. C. Kok
- (S)W1.69: Onderzoek na appelmelksuurgisting in S.A. wyne:
- *69/1: - Invloed van melksuurvormende bakterieë op die kwaliteit en samestelling van droë rooiwyn in Suid-Afrika. 1979. J.P. Snyman
- 69/2: - Identifikasie en evaluasie van appelmelksuurbakterieë in Suid-Afrikaanse rooiwyne. 1978. Louisa M. van der Westhuizen
- (S)W1.72: Roetine mikrobiologiese ontledings en ondersoeke vir wynprodusente
- (S)W1.73: Effek van mossamestelling op gisting en wyngehalte:
- 73/1: - Invloed van die stikstoffraksies in druiwemos op gistingstempo en wynkwaliteit. 1979. T.J. van Rooyen
- (S)W1.74: Factors affecting the quality of brandy:
- 74/1: - Influence of off-odours and flavours in rebate wines on the quality of brandy. 1979. G.W.W. Wagener
- (S)WP.29: Druif- en kelderfaktore wat wynkwaliteitskomponente beïnvloed:
- 29/1: - Faktore wat reproduseerbaarheid van wyngestofvorming en -gehalte bepaal. 1978. A.C. Houtman

Sitrus en Subtropiese Gewasse/Citrus and Subtropical Crops

SITRUS/CITRUS

BEMESTING/FERTILIZERS

- (S)N.114: Voedingsbehoefte van sitrus:
- 114/3: - Bemesting in die Citrusdalgebied. 1971. S.F. du Plessis, G. Smart
- 114/4: - Geskiktheid van verskillende magnesiumbronne. 1974. S.F. du Plessis, G. Smart
- 114/5: - Suurlemoene: Bepaling van blaarsamestellingsnorme vir optimum produksie. 1977. S.F. du Plessis, T.J. Koen, G. Smart
- 114/6: - Kaliumproef op probleemgronde. 1977. S.F. du Plessis, G. Smart
- 114/7: - Faktore wat vrugsgrootte beïnvloed. 1977. S.F. du Plessis

CULTIVARS

- (S)N.1: Sitrusonderstamstudies:
- 1/7: - Growweskil-suurlemoenseleksies as onderstam vir sitrus. 1968. P.J. Müller
- 1/8: - Onderstamme vir Olinda nusellêre Valencia en Palmer nusellêre nawels in Oos-Transvaal, Oos-Kaap en Wes-Kaap. 1969. P.J. Müller, W.J. Bruwer
- 1/9: - Onderstamme vir pomelocultivars in die Makatinivlaktegebied en die Oos-Kaap. 1969. P.J. Müller, W.J. Joubert
- 1/10: - Bestandheid teen *Tristeza*-virus van verskillende Bitter Seville-seleksies as onderstam vir soetlemoen. 1969. J.N. Moll, T.N. Trench
- 1/11: - Waardebepaling van genera verwant aan *Citrus* en *Poncirus*. 1970. J.H. de Lange, J.N. Moll
- *1/13: - Evalueringstegnieke vir sitrusonderstamme m.b.t. brakverdraagsaamheid. 1978. P.J.L. Grobler
- (S)N.2: Sitrusbostamstudies:

- 2/9: - Produksie van virusvry nusellêre sitrusmoedermateriaal. 1968. G.S. Bredell
- 2/13: - Reaksie van 'n reeks bostam-onderstamkombinasies van sitrus en verwante soorte. 1972. W.A. Eshuys
- 2/14: - Waardebepaling van nartjies en nartjiekruisings. 1972. J.H. de Lange
- 2/15: - Bestuiwingsbehoefte. 1971. J.H. de Lange
- 2/16: - Reaksie van ses Valencia-seleksies in vier verskillende gebiede. 1974. W.P. Burger
- 2/17: - Reaksie van vyf nawelseleksies in drie verskillende gebiede. 1974. P.J. Müller, W.J. Bruwer
- 2/18: - Reaksie van sewe pomeloseleksies in vier verskillende gebiede. 1972. P.J. Müller, W.J. Bruwer
- 2/19: - Reaksie van vyf suurlemoenseleksies in drie verskillende gebiede. 1973. P.J. Müller, W.P. Burger
- 2/21: - Midseisoen-cultivars. 1976. P.J. Müller, W.J. Bruwer
- 2/22: - Rooi pomeloseleksie, evaluering. 1977. P.J. Müller
- 2/23: - Vroeë en laat nawelseleksies, evaluering. 1977. P.J. Müller, W.J. Bruwer

EVAPOTRANSPIRASIESTUDIES/EVAPOTRANSPIRATION STUDIES

- (S)N.103: Besproeiing van sitrusboorde onder Oos-Kaapse toestande:
- 103/1: - Bepaling van evapotranspirasie en grondvog in sitrusboorde. 1968. G.C. Green

HERPLANTING/REPLANTING

- (S)N.82: Herplanting van sitrus:
- 82/5: - Invloed van grondsteriliseerders en grondherwinningsmaatreëls op die groei van sitrusbome op ou sitrusgrond - Zebediela. 1971. W.P. Burger
- 82/6: - Reaksie van verskillende onderstamme op braksoute en wortelparasiete. 1971. W.P. Burger
- 82/8: - Invloed van verskillende onderstam-bostamkombinasies op die groei van die daaropvolgende kombinasies. 1971. W.P. Burger

INSEKTEPLAE/INSECT PESTS

- (S)N.78: Integration of biological and chemical control of citrus pests:
- 78/1: - Control of red scale, *Aonidiella aurantii*. 1964. E.C.G. Bedford
- 78/6: - Integrated control of red scale, *Aonidiella aurantii*, in the Transvaal Lowveld. 1967. E.C.G. Bedford
- 78/7: - Study of the South African citrus thrips, *Scirtothrips aurantii*. 1969. E.C.G. Bedford, D.L. Milne
- (S)N.93: Studies on spoilage in citrus fruits:
- *93/2: - Fruit fly control investigation on citrus. 1955. I.B. Kok

NEMATODES

- (S)N.81: Eelworm studies:
- 81/8: - Citrus eelworm control. 1971. D.L. Milne, E.A. de Villiers

ONKRUIDBESTRYDING/WEED CONTROL

- (S)N.84: Bewerking van sitrusboorde:
 84/1: - Chemiese onkruidbeheer in sitrusboorde. 1967. A.P. Vincent

SIEKTES/DISEASES

- (S)N.62: Histochemical indexing methods for citrus virus diseases. 1961. J.V. da Graca, J.N. Moll, S.P. van Vuuren
- (S)N.120: Mycoplasma in citrus and subtropical fruit trees:
 120/1: - Isolation and culturing of greening mycoplasma. 1971. J.N. Moll
 120/2: - Pathogenicity of mycoplasma in greening. 1971. J.N. Moll
 120/3: - Control of greening mycoplasma. 1971. J.N. Moll, J.V. de Grace, S.P. van Vuuren
- (S)N.140: Tristeza virus complex:
 140/1: - Tristeza investigations in citrus on the Messina experiment farm. 1976. Thelma N. Trench
 140/3: - Mild strain protection of grapefruit and limes against tristeza stem pitting. 1976. Thelma N. Trench

TELING/BREEDING

- (S)N.1: Sitrusonderstamstudies:
 1/12: - Teling. 1970. J.H. de Lange, J.N. Moll
- (S)N.2: Sitrusbostamstudies:
 2/20: - Teling. 1974. J.H. de Lange

VERBOUING/CULTIVATION

- (S)N.99: Studie van grondvoghuishouding in verskillende grondsoorte onder verbouing van subtropiese gewasse:
 99/4: - Besproeiing van sitrus, Addo. 1979. G.S. Bredell
- (S)N.123: Plantafstande van sitrus:
 123/1: - Oplei en heiningsnoei van sitrusbome. 1972. W.A. Eshuys

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BEMESTING/FERTILIZERS

- (S)N.138: Voedingsbehoefte van tee:
 138/1: - Bemestingsproef met N, K, Ca en Mg. 1975. P.C. van Zyl, J.F. Waldeck

CULTIVARS

- (S)N.122: Teestudies:
 122/1: - Teeseleksie. 1971. K. de Rooster

KOFFIE/COFFEE

SNOEI/PRUNING

- (S)N.79: Koffienavorsing in the Transvaalse Laeveld:
 79/2: - Snoeimetode. 1965. K. de Rooster

PYNAPPELS/PINEAPPLES

BEMESTING/FERTILIZERS

- (S)N-OL.12: Bemestingsproewe met pynappels (*Ananas comosus*):
 12/3: - Blaarmonsternemingstegniek en blaarontledingsopname. 1972. S.F. du Plessis, E.R. Dalldorf
 12/4: - Makroëlementbemesting. 1972. W. Langenegger, D.B. Dalldorf
 12/5: - Invloed van bemesting op nitraatgehalte van pynappelvrugte. 1978. B.L. Smith

DEKLAE/MULCHING

- (S)N.143: Mulching of pineapples:
 143/1: - Evaluation of various mulching practices. 1978. D.P. Keetch

INSEKTEPLAE/INSECT PESTS

- (S)N.133: Arthropod pineapple pests:
 133/2: - Fruit and foliar pests. 1974. G.J. Petty
 133/3: - Soil pests. 1974. G.J. Petty

NEMATODES

- (S)N.81: Eelworm studies:
 81/9: - Incidence and control of nematodes on pineapples. 1971. D.L. Milne, D.P. Keetch

ONKRUIDBESTRYDING/WEED CONTROL

- (S)N-OL.1: Onkruidbeheer by pynappels (*Ananas comosus*):
 1/3: - Siftingsproewe met onkruidmiddels op pynappels. 1971. E.R. Dalldorf

PRODUKSIE/PRODUCTION

- (S)N.134: Phenological studies of the pineapple plant:
 134/1: - Study of the natural growth cycle. 1974. D.P. Keetch, S.J. Bozalek

SIEKTES/DISEASES

- (S)N.145: Post-harvest problems of pineapple fruit:
 145/1: - Control of post-harvest diseases and disorders of pineapple fruit. 1979. Mariana Bosch
 (S)N-OL.8: Control of disease in pineapples (*Ananas comosus*):
 8/7: - Incidence, geographic distribution and seasonal occurrence of abnormalities and diseases. 1974. D.P. Keetch

SPASIËRING/ESPACEMENT

- (S)WP.144: Plant espacement in pineapples:
 144/1: - Optimum plant espacement for pineapples in South Africa. 1977. E.R. Dalldorf

TELING/BREEDING

- (S)N-OL.5: Veredeling van die pynappel (*Ananas comosus*):
 5/1: - Seleksie as telingsmedium by die pynappel. 1967. E.R. Dalldorf, G.S. Webster

VERBOUING/CULTIVATION

- (S)N-OL.10: Use of synthetic hormones on pineapples (*Ananas comosus*):
 10/4: - Evaluation of the effectiveness of various forcing agents. 1970. E.R. Dalldorf, G.S. Webster

AVOKADO/AVOCADO

BEMESTING/FERTILIZERS

- (S)N.109: Voedingsbehoefes van die avokado:
 109/1: - NPK-bemestingsproef - Burgershall. 1970. T.J. Koen, W. Langenegger

INSEKTEPLAE/INSECT PESTS

- (S)N.130: Ontwikkeling van behandelings vir subtropiese vrugte wat voldoen aan kwarantynvereistes van ander lande:
 130/1: - Uitvoer van avokado's. 1974. A. Swartz, D.L. Milne

OPBERGING/STORAGE

- (S)N.38: Koelopberging van avokado:
 38/1: - Goedhouvermoë van avokado wat per boot na die buiteland verskeep word. 1962. D.H. Swarts

SIEKTES/DISEASES

- (S)N.86: Avocado diseases:
 86/3: - Virus diseases. 1968. J.V. da Graca, S.P. van Vuuren
 86/6: - Testing chemicals for the control of *Phytophthora cinnamomi*. 1971. R.T. Frean, R. Wood, J.N. Moll, R. Mataré
 86/7: - Testing the resistance of avocado cultivars to *Phytophthora* root rot. 1971. R. Wood, R.T. Frean

VOORTPLANTING/PROPAGATION

- (S)N.117: Tuinboukundige aspekte van die avokado:
 117/2: - Vegetatiewe voortplanting. 1971. A.I.J. Bester
 117/4: - Abnormale entverbinding. 1972. A.I.J. Bester

PIESANGS/BANANAS

BEMESTING/FERTILIZERS

- (S)N.111: Voedingsbehoefte van die piesang:
- *111/1: - Plantontwikkeling en blaarsamestelling. 1970. S.F. du Plessis, P.C. van Zyl
 - 111/3: - Landswey ondersoek om die verwantskap tussen plantsamestelling en opbrengs te bepaal. 1970. P.C. van Zyl

CULTIVARS

- (S)N.102: Evaluation of promising Cavendish banana selections:
- 102/1: - Preliminary selection. 1968. F.A. Kuhne

NEMATODES

- (S)N.81: Eelworm studies:
- 81/11: - Banana eelworms. 1976. R.K. Jones, E.A. de Villiers

OESTYDREGULERING/CROP TIMING

- (S)N.70: Crop timing of bananas

PRODUKSIE/PRODUCTION

- (S)N.101: Phenological study of the banana plant:
- *101/1: - Studies on leaf emergence, sucker growth, flower initiation and fruiting cycle. 1968. F.A. Kuhne, S.J. Bozalek

SIEKTES/DISEASES

- (S)N.139: Banana diseases:
- 139/1: - Panama wilt disease. 1977. B.Q. Manicom

TEGNOLOGIE/TECHNOLOGY

- (S)N.135: Na-oeshantering van subtropiese vrugte:
- 135/1: - Na-oeshantering van piesangs. 1975. D.H. Swarts

MANGO

BEMESTING/FERTILIZERS

- (S)N.126: Voedingsbehoefte van die mango:
- 126/1: - NPK-bemestingsproef in die Komatipoortgebied. 1972. S.F. du Plessis, G. Smart

CULTIVARS

- (S)N.110: Mangostudies:

INSEKTEPLAE/INSECT PESTS

- (S)N.91: Mangosnuitkewerstudies:

PRODUKSIE/PRODUCTION

- (S)N.110: Mangostudies:
 110/3: - Fisiologiese ondersoek na vrugvorming. 1972. L.J. van Lelyveld

SIEKTES/DISEASES

- (S)N.118: Mango diseases:
 118/1: - Control of bacterial spot disease on mangoes caused by *Erwinia mangiferae*. 1970. R. Wood
 118/2: - Control of storage diseases. 1971. D.H.Swarts
 118/3: - Beheer van mangoblommisvorming. 1978. R.Mataré

LIETSJIES/LITCHIS

BEMESTING/FERTILIZERS

- (S)N.100: Voedingsbehoeftes van die lietsjie:
 100/1: - Reaksie van die lietsjie op N-, P- en K-toedienings ten opsigte van oes en blaarsamestelling. 1968. T.J. Koen, W. Langenegger

OPBERGING/STORAGE

- (S)N.39: Na-oeshantering van lietsjies:

PRODUKSIE/PRODUCTION

- (S)N.92: Litchi studies:
 92/2: - Comparison between grafted and airlayer litchi trees. 1968. A.J. Joubert

GRENADELLAS/GRANADILLAS

BEMESTING/FERTILIZERS

- (S)N.129: Voedingsbehoeftes van die grenadella:
 129/1: - Bemestingsproef en blaarontledingsopname. 1973. T.J. Koen, G. Smart

CULTIVARS

- (S)N.88: Introduction of new granadilla species:
 *88/1: - Preliminary studies on suitability for fresh fruit and processing purposes. 1973. F.A. Kuhne

SIEKTES/DISEASES

- (S)N.136: Virus diseases of citrus and subtropical fruit:
 136/1: - 'Woodiness' disease of granadillas. 1974. J.V. da Graca

KOEJAWELS/GUAVAS

CULTIVARS

- (S)N.113: Guava studies:
 113/1: - Guava selections. 1970. L.C. Bolt

PRODUKSIE/PRODUCTION

- (S)N.113: Koejawelstudies:
 113/2: - Verskillende tye van snoei. 1975. J.J. Kruger
 113/3: - Verskillende snoeistelsels. 1975. J.J. Kruger

PAPAJA/PAPAYA

OPBERGING/STORAGE

- (S)N.116: Post-harvest studies on papaya:
 116/1: - Control of storage diseases affecting papayas. 1970. D.H. Swarts

TELING/BREEDING

- (S)N.142: Tuinboukundige aspekte van die papaja:

ALGEMEEN/GENERAL

- (S)N.137: Bepaling van die potensiaal van subtropiese gewasse:
 137/1: - Aanpassingstudies. 1975. A.J. Joubert, N.W. Smyth, K. de Rooster, A.I.J. Bester, J.P. Carstens, F.A. Kuhne

Neute/Nuts

MACADAMIA

BEMESTING/FERTILIZERS

- (S)N.97: Voedingsbehoefte van die macadamia:
 97/1: - Reaksie van macadamia op N-, P- en K-toediening. 1968. T.J. Koen, W. Langenegger

CULTIVARS

- (S)N.96: Macadamiastudies:
 *96/1: - Evaluasie van seleksies in die Republiek van Suid-Afrika. 1968. A.J. Joubert
 96/4: - Lokaliteitsproewe met belowende macadamiaseleksies en -cultivars in Suid-Afrika. 1969. A.J. Joubert

VERBOUING/CULTIVATION

- (S)N.96: Macadamiastudies:
 96/6: - Plantafstande vir macadamiabome. 1971. A.J. Joubert

PEKAN/PECAN

BEMESTING/FERTILIZERS

- (S)N.106: Voedingsbehoefes van die pekanneut:
 106/1: - Reaksie van pekanneute op N-, P- en K-toediening ten opsigte van oes en blaarsamestelling. 1969. T.J. Koen, W. Langenegger

CULTIVARS

- (A)T-Rp.163/1: Pekanneute:
 163/1/1: - Evaluering van pekanneutcultivars in die Hoëveld en Middelveld. 1975. T. Haulik, K.G. Zwahlen
 (S)N.124: Tuinboukundige aspekte van die pekanneut:
 124/1: - Uittoets van verskillende cultivars. 1971. A.J. Joubert

AMANDELS/ALMONDS

CULTIVARS

- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
 166/15: - Amandelcultivars. 1971. E.J. van Zyl

VERBOUING/CULTIVATION

- (S)WP.242: Allerlei bessie- en sagtevrugte: Verbouing in die Winterreëngebied:
 242/1: - Evaluering van amandelcultivars. 1978. E.J. van Zyl

Diverse tuinbougewasse/Sundry Horticultural Crops

KIWIVRUGTE/KIWI FRUIT

VERBOUING/CULTIVATION

- (S)WP.222: Kiwivrugte in Wes-Kaapland:
 222/1: - Evaluering van Kiwivrugtecultivars: Onderstamme en kruisbestuiwers. 1977. D.C. Bosman

ROOIBOSTEE/RED TEA

INSEKPLAE/INSECT PESTS

- (S)WP.243: Diverse toegewese gewasse: Verbouing in die Winterreëngebied:
 243/3: - Chemiese beheer van die belangrikste plae van rooibostee. 1978. P.L. Swart, J.W. van Putten

VERBOUING/CULTIVATION

- (S)WP.243: Diverse toegewese gewasse: Verbouing in die Winterreëngebied:

- 243/4: - Groeisiklus en koolhidraat- en stikstofreserwes van rooitee. 1979. P.J.C. Stassen

VYE/FIGS

CULTIVARS

- (S)WP.166: Evaluering van ingevoerde en plaaslik geselekteerde en geteelde cultivars en onderstamme van bladwisselende vrugte en neute:
- 166/19: - Evaluering van vyecultivars. 1974. E.J. van Zyl

DIEREPRODUKSIE/ANIMAL PRODUCTION

PRODUKSIE/PRODUCTION

Diersoort/Animal Type

VLEISBEESTE/BEEF CATTLE

BEDRYFSONDERSOEK/ENTERPRISE INVESTIGATION

- N-Ce.115: Production and reproduction in beef cattle:
 115/6: - Wintering of pregnant beef cows. 1972. H.J. Meaker, S.F. Lesch
- N-Ko.5: Production systems for beef cattle and sheep in the East Griqualand area:
 5/3: - Effect of season of mating on reproductive and weaning performance of beef females. 1972. A.D. Lyle, G.J. Muller
- SW-Om.2: Verhoogde beesvleisproduksie deur verbeterde bestuurspraktyke:
 2/1: - Vroeg en laat speen van Afrikanerkalwers. 1967. J.P. Gressmann

BEESPLAASPROEFBOERDERY/EXPERIMENTAL RANCHING

- T-Rp.27: Soutpan-beesplaasproefboerdery. 1964. J.G. Low, G. Marincowitz, C.D. Kruger

FISIOLOGIE/PHYSIOLOGY

- OK-Do.66: Beesvleisproduksie in die Oos-Kaap:
 66/6: - Invloed van spanning op die bynierkorteks-aktiwiteit van *Bos indicus*- en *Bos taurus*-verse onder ingekraalde toestande en onder veldtoestande. 1976. J.A. Erasmus

GESLAGSFISIOLOGIE/REPRODUCTIVE PHYSIOLOGY

- (A)VS-Pr.24: Erflike gebreke en afwykings by plaasdiere:
 24/2: - Die aard en voorkoms van hipoplasie van die gonades onder inheemse beesrasse en maatreëls om dit te verminder. 1979. E.H.H. Meyer, A.R. Gee, E. Penderis, J.H. Hofmeyr
- (A)VS-Pr.39: Geslagsfisiologie van inheemse en uitheemse manlike diere in Suid-Afrika:
 *39/3: - Invloed van 'n hoër voedingspeil op die geslagsontwikkeling van Herefordbulle. 1971. D. Visser
- (A)VS-Pr.79: Studies oor die reprodktiewe doeltreffendheid van die koei:
- O-Vh.71: Reproduksie by beeste:
 *71/3: - Ondersoek na die fisiologiese en histologiese aspekte van die *post partum*-periode by die Afrikanerkoei. 1972. W.A. Coetzer, J.H. van Niekerk
- T-Ng.66: Vrugbaarheidstudies op vleisbeeste in die Transvaal:
 66/1: - Voorkoms van estrus. 1978. C.J. Dreyer, D.W. Eden, G. Marincowitz

KLIMAAT/CLIMATE

- N-Th.12: Effect of certain environmental conditions on the growth, functional development and reproduction of beef cattle in some areas of Natal:
- 12/1: - Effect of different breeding and feeding areas. 1963. A.W. Lishman, S.F. Lesch, A. van Niekerk

PRODUKSIESTUDIES/PRODUCTION STUDIES

- N-Ce.115: Production and reproduction in beef cattle:
- 115/6: - Over-wintering of pregnant beef cows. 1973. H.J. Meaker
- 115/7: - Determination of the production potential and cost of farm-produced roughage. 1971. R.M. Bredon, A.D. Lyle, B.J. Lyle
- 115/14: - Performance of dual purpose and British beef cattle on kikuyu pasture. 1976. B.P. Louw, P.E. Bartholomew, S.F. Lesch
- 115/15: - Effect of stocking rate and lick supplements on animal performance. 1975. S.F. Lesch, P. Whitwell, P.J. Edwards, A. van Niekerk, B.D. Mappedoram
- T-Rp.30: Produksievermoë van vee op optimaal bestuurd veld:
- 30/3: - Produksievermoë van Bonsmarabeeste in die Suurbosveld. 1971. G. Marincowitz, J.G. Low, D.J. Bosman

SEROLOGIESE STUDIES/SEROLOGICAL STUDIES

- (A)VS-Pr.38: Bereiding van bloedgroeppreagente en immunologiese studies by plaasdiere, laboratoriumdiere en verwante spesies:
- 38/1: - Bereiding van beesbloedgroeppreagente vir roetinetootse en navorsing. 1967. S.J. du Plessis
- (A)VS-Pr.41: Verwantskapstudies van bloed- en serumfaktore (geneties) met ekonomies belangrike produksie- en reproduksie-eienskappe by plaasdiere en verwante spesies:
- 41/3: - Serologiese en proteïenpolimorfe genetiese merkers en hulle verband met produksie-eienskappe by vleisbeeste. 1971. E.H.H. Meyer, C.Z. Roux

TELING/BREEDING

- O-Av.8: Improvement of beef cattle by breeding:
- 8/5: - Study of genetic environmental interactions in growth rate of Afrikaner cattle and relationship between gains during different periods. 1967. T.H. Kruger

VLEISPRODUKSIE/BEEF PRODUCTION

- (A)VS-Pr.76: Kwantitatiewe en kwalitatiewe vleisproduksiestudies:
- 76/7: - Ondersoek na sekere tegnieke vir die prestasietoetsing van jong bulle. 1973. J.J. Harmse, R.T. Naudé
- 76/8: - Development of the skeletal muscular system in male animals of different breeds of beef cattle. 1973. R.T. Naudé, J.H. Dreyer
- 76/9: - Karkasevaluering van jong suiwer- en kruisgeteelde Afrikanerosse geslag op vier liggaamsmassas. 1975. R.T. Naudé, A.H. Mentz
- 76/12: - Produksie en reproduksie van kort skrotumbulle. 1977. R.T. Naudé, D. Visser

- H-BL.68: Produksie van wintergrane as weidingsgewasse in die Hoëveldstreek:
 68/4: - Beesvleisproduksie op wintergraanweidings op 'n vlak Avalongrond in die Oos-Vrystaat. 1979. K.G. Cronje
- H-Ps.214: Intensiewe beesvleisproduksie:
 *214/1: - Doeltreffendheid van beesvleisproduksie tot op verskillende lewende massas. 1964. H.J. van der Merwe
 214/3: - Proteïenbehoefes van agtienmaandoud-osse gedurende die afrondingsfase. 1975. H.J. van der Merwe
 *214/4: - Doeltreffendheid van stygende energiepeile gedurende die afrondingsperiode van vleisbeeste. 1976. H.J. van der Merwe
- O-Vh.70: Verhoging van vleisproduksie deur doelgerigte kruisteling:
 70/4: - Kruisteling met die Afrikanerkoei as basis met verskillende grootraamvleisrasse onder 'n semi-intensiewe stelsel van produksie. 1973. A.H. Mentz, R.T. Naudé, W.A. Coetzer
 70/5: - Aanwending van verskillende vleisbeestipes (rasse) as manlike en vroulike teelmateriaal in suiwer- en kruisteelstelsels. 1976. A.H. Mentz, W.A. Coetzer, R.T. Naudé
 70/6: - Potensiaal van vroulike, kruisgeteelde diere uit Jerseymoeders vir produksie van slagkalwers. 1976. A.H. Mentz, J.A. Vermeulen, M.C. Basson, J.E. Coetzee
 70/7: - Produksiepotensiaal van vroulike kruisings uit Afrikanerkoeie met verskeie grootraamrasse. 1976. A.H. Mentz, W.A. Coetzer, M.C. Basson, T.H. Strydom
- T-Mr.6: Beesvleisproduksiestelsels vir die Transvaalse Bosveld:
 6/1: - Geskikte rasse, kruise en teelstelsels vir die Soetbosveld. 1976. H.P. Eloff, C.J.F. Lüdemann, E.E. Lademann, D.L. Els
- T-Ng.54: Produksievermoë van jong vleisbeeste op verskillende voedingspeile:
 54/1: - Invloed van verskillende voedingspeile op die groei, produksie en reproduksie van vleisrasverse. 1971. C.J. Dreyer, D.W. Eden, W.R.F.J. le Roux
 54/2: - Invloed van voor- en naspeense voedingsbehandelings op die groei en markklaarheid van jong vleisrasbulle. 1971. C.J. Dreyer, W.R.F.J. le Roux, D.W. Eden

VOEDING/NUTRITION

- (A)VS-Pr.73: Doeltreffendheid van voerverbruik by plaasdiere:
 *73/9: - Doeltreffendheidsrangorde van groeiende vleisbeeste op 'n kragvoer- en 'n ruvoerrantsoen. 1976. H.H. Meissner, C.Z. Roux, H.S. Hofmeyer
 73/11: - Bestudering van vrywillige inname van voermengsels. 1979. H.H. Meissner, C.Z. Roux, J.P. Pienaar
- H-Ps.214: Intensiewe beesvleisproduksie:
 214/2: - Mieliemeelbyvoeding aan jong osse op somerveld. 1968. H.J. van der Merwe
- H-Ps.232: Inkuiling en kuilvoervoeding:
 232/7: - Mieliemeelaanvulling tot mieliekuilvoerrantsoene vir Friesosse en -bulle. 1970. D.J. Theunissen, R.J. Theunissen
 232/9: - Kostebesparing op proteïenaanvulling vir jong beeste op mieliekuilvoerrantsoene. 1971. H.J. van der Merwe
 232/10: - Ureum-lusernmeel-aanvullings vir jong beeste op mieliekuilvoer. 1972. H.J. van der Merwe
 232/16: - Invloed van preservering en proteïenstabilisering van mieliekuilvoer op die voedingswaarde daarvan vir vleisbeeste. 1978. H.J. van der Merwe, L.D. Snyman

- 232/18: - 'n Vergelyking tussen mieliekuilvoer en *Eragrostis curvula*-hooi as bronne van ruvoer in afrondingsrantsoene van vleisbeeste. 1979. H.J. van der Merwe
- O-Gl.125: Evaluering van die voedingswaarde van ruvoere en weidings. J.R. van Zyl, M.H. Neitz, C.L. Hartman, L.C. Biel
- 125/17: - Evaluering van die voedingswaarde van die natuurlike weiding van Vaalharts. 1974. E.A.N. Engels, B. Ferreira
- OK-Do.53: Oorwintering van beeste in die suurveld van die Oos-Kaap:
- 53/10: - Benutting van Monensin-natrium in winter- en somerlekke in die suurgrasveld van die Oos-Kaapstreek. 1979. W.P. Henning
- T-Tw.23: Kuilvoerbenutting vir beesvleisproduksie in die Springbokvlakte:
- 23/1: - Verrykte babalakuilvoer vir die afronding van osse. 1967. J.J. Coetzee

VOEDINGSFISIOLOGIE/NUTRITION PHYSIOLOGY

- O-Gl.125/24: Invloed van droging van monsters versamel met slukdermgefistuleerde diere op die verwantskap tussen *in vivo*- en *in vitro*-verteerbaarheid. 1977. E.A.N. Engels, B. Ferreira, L.C. Biel

VOORTPLANTING/REPRODUCTION

- H-Ps.197: Verhoogde vrugbaarheid by vleisbeeste:
- 197/2: - Invloed van byvoeding op die vrugbaarheid van jong koeie. 1963. D.J. Theunissen, R.J. Theunissen
- N-Ce.115: Production and reproduction in beef cattle:
- 115/2: - Influence of early or late summer calving and of supplementary feeding on the growth of the calf and the reproductive performance of the cow in the Thornveld of Natal. 1967. A.W. Lishman
- 115/3: - Influence of early or late spring calving and of supplementary feeding on the growth of the calf and the reproductive performance of the cow in the transitional Highland Sourveld. 1967. A.W. Lishman, A.D. Lyle
- 115/17: - Verwantskap tussen verskillende voedingspeile voor kalwing en teikenmassa ten aanvang van die teelseisoen op die reproduksievermoë van die vleisbeeskoei. 1979. H.J. Meaker
- 115/18: - Oestrus en ovulasie by volwasse vleisbeeskoeie soos beïnvloed deur 'n verandering in liggaamsmassa. 1979. H.J. Meaker
- O-Vh.71: Reproduksie by beeste:
- 71/4: - Ondersoek na praktyke vir die inkorting van die kalfinterval by Afrikanerkoeie. 1979. W.A. Coetzer
- 71/5: - Stabilisering van LH-vrystelling tydens gesinchroniseerde estrusperiodes by Afrikanerkoeie. 1979. W.A. Coetzer
- 71/6: - Ondersoek na die gebruik van gonadotrofiese-vrystellingshormoon (Gn-VH) by die toepassing van KI op Afrikanerkoeie onder ekstensiewe toestande. 1979. W.A.Coetzer
- OK-Do.70: Reproduksiedoeltreffendheid van vleisbeeste in die Oos-Kaap:
- 70/1: - Invloed van aanvullende voeding op die naspeense groei en die reproduksie van vleisrasverse. 1971. S.W. Bosman
- SW-Uk.1: Verhoging van vrugbaarheid by beeste:
- 1/1: - Waarde van energiebyvoeding aan produserende koeie. 1969. P.S. van der Merwe, G. Thomas

- 1/2: - Onderzoek na dekseisoene vir beeste op die Sandveldnavorsingstasie. 1973. J. Smit, J.B. van de Vyver
- 1/3: - Puberteit en die effek van ouderdom van eerste paring op produksie-eienskappe by die Simmentaler. 1973. C.H. Smit, L.P. van Wyk
- T-Mr.6: Beesvleisproduksiestelsels vir die Transvaalse Bosveld:
- 6/2: - Die byvoeding van 'n energie- en proteïenryke kragvoer aan kalwerkoeie op veldweiding. 1976. H.P. Eloff, C.J.F. Lüdemann, E.E. Lademan

MELKBEESTE/DAIRY CATTLE

BIOCHEMIE/BIOCHEMISTRY

- (A)VS-Pr.35: Elektroforetiese en ander chemies-fisiese studies op plaasdiere, laboratorium- en verwante spesies (genetiese polymorfisme):
- 35/5: - Biochemiese en genetiese studies van 'n nuwe hemoglobienband by beeste. 1976. Marie Schwellnus, M.R. Schwellnus
- 35/6: - Milk protein polymorphism in cattle. 1976. G. Guerin, E.H.H. Meyer
- 35/7: - Biochemical genetic studies on haemoglobins. 1975. G. Guerin, E.H.H. Meyer

FISIOLOGIE/PHYSIOLOGY

- (A)VS-Pr.44: Aspects of lactation in the production of milk or cream:
- 44/1: - Studies on the synthetic activity of the mammary gland. 1975. H. Lück
- (A)VS-Pr.99: Melkproduksiepraktystudies in Suid-Afrika:
- 99/2: - Vergelykings van maatstawwe vir die bepaling van steurnisse van die fisiologiese aktiwiteit van die lakterende uier. 1977. F. du Toit

MELKPRODUKSIE/MILK PRODUCTION

- (A)VS-Pr.101: Statistiese metodes vir herhaalde waarnemings:
- 101/1: - Model vir die beskrywing van melkproduksie. 1976. C.Z. Roux
- (A)VS-Pr.102: Eksperimentele ontwerp vir die veekunde:
- 102/1: - Interaksie tussen eksperimentele eenheid en behandeling. 1976. C.Z. Roux
- SW-Uk.2: Suiwelboerdery in Suidwes-Afrika:
- 2/1: - Melkproduksie by beeste onder semi-ekstensiewe toestande, 1968. C.H. Smit, G. Thomas
- T-Mr.2: Melkproduksieproef. 1952. H.P. Eloff
- W-Oq.18: Melkproduksiepotensiaal in die George- en Knysnagebied:
- 18/2: - Evaluering van voedingspraktyke vir melkkoeie. 1974. C.J.J. Brand

SUIWELKUNDE/DAIRY SCIENCE

- (A)VS-Pr.21: Studies oor melkaantekeningnavorsing:
- 21/1: - Bepaling van 'n maatstaf vir 'elite'-koeie. 1964. G.P. Kühn
- (A)VS-Pr.45: Hulpmiddels en geriewe in die produksie van melk of room. 1975

TELING/BREEDING

- (A)VS-Pr.80: Teling van melkbeeste: Seleksie en teling vir melkbaarheids- en melkkwaliteitseienskappe in 'n eksperimentele kudde. 1971. J.H. Hofmeyr, M.H. Neitz, C.Z. Roux
- (A)VS-Pr.105: Evaluation and application of techniques for cytogenetic screening of farm animals:
105/1: - Cytogenetic screening of cattle. 1978. E.H.H. Meyer, E.J.Harris (see also beef cattle)

VOEDING/NUTRITION

- (A)VS-Pr.26: Stikstofmetabolisme by herkouters:
26/7: - Onderskeidingsvermoë van sekere beskikbare toetse vir kwaliteitsbepaling van melkvervangers. 1977. L.H.P. Liebenberg
26/10: - Aanwending van ureum as stikstofsupplement by hoogproduserende melkkoeie. 1979. H.H. Neitz, L.H.P. Liebenberg
- H-BI.68: Produksie en evaluasie van wintergrane as weidingsgewasse in die Hoëveldstreek:
68/4: - Melkproduksie op wintergraanweidings in die Oos-Vrystaat op 'n vlak Avalongrond. 1979. K.G. Cronje
- H-Ps.242: Melkproduksiestelsels in die Hoëveldstreek:
242/1: - Aanvulling op beperkte gras-klawerweiding vir melkkoeie. 1973. W.C. Hugo
242/5: - Benutting van skaapmis as remfaktor in kragvoermengsels vir melkkoeie. 1979. W.C. Hugo, C.W. Cruywagen
242/6: - Benutting van *Digitaria smutsii* as voergewas deur lakterende melkkoeie. 1979. W.C. Hugo, R.H. Drewes
- H-Ps.263: Voeding en bestuur van kalwers:
263/1: - Optimisering van sojameel, weipoeier en kolostrum vir die grootmaak van suiwelkalwers. 1979. C.W. Cruywagen
- N-Ce.123: Economic and technical aspects of milk production from pastures in Natal:
123/5: - Utilization of urea by lactating cows when fed maize. 1977. C.D. Hamilton, R.M. Bredon
- O-GI.125: Nutritive evaluation of forages and pastures:
125/17: - Evaluering van die voedingswaarde van die natuurlike weiding van Vaalharts. 1974. E.A.N. Engels, B. Ferreira
- OK-Do.55: Benutting van akkerbougewasse as dierevoeding:
55/7: - *Eragrostis curvula* (Ermelo) vir melkkoeie. 1971. S.W. Bosman
- OK-Do.73: Kunsmatige grootmaak van kalwers:
73/2: - Benutting van weipoeiers in melkvervangers vir kalwers. 1979. W.P. Henning
- W-Eb.93: Voeding en versorging van groeiende melkkrasbeeste in Wes-Kaapland:
93/7: - Evaluasie van kalfgrootmaakstelsels in die George-Knysna-area. 1978. C.J.J. Brand
93/8: - Invloed van speentegniek op die groei en ontwikkeling van vroeggespeende kalwers. 1978. C.J.J. Brand
- W-Eb.104: Voeding van melkbeeste in die Winterreënstreek:
104/1: - Benutting van bytsoda-behandelde koringstrooi deur die lakterende melkkoeie. 1977. J. de K. van Dyk

VOEDINGSFISIOLOGIE/NUTRITIONAL PHYSIOLOGY

- O-Gl.125: Nutritive evaluation of forages and pastures:
 125/24: - Invloed van droging van monsters versamel met slukdermgefistuleerde diere op die verwantskap tussen *in vivo*- en *in vitro*-verteerbaarheid. 1977. E.A.N. Engels, B. Ferreira, L.C. Biel

VLEISSKAPE/MUTTON SHEEP

BEDRYFSONDERSOEK/ENTERPRISE INVESTIGATION

- W-Lg.12: Skaapbestuurspraktyke in die Winterreënstreek:
 12/3: - Versnelde paringsfrekwensie by skape in die Winterreënstreek. 1973. L.S. Erasmus
 12/5: - Studie van oorsake tot hoë lamvrektes in die Winterreënstreek. 1978. T.T de Villiers

BESTUUR/MANAGEMENT

- OK-Bh.44: Production systems in the Eastern Cape:
 44/1: - Intensive sheep production system, Bathurst. 1976. F.O.C.W. Karberg

TELING/BREEDING

- K-Gf.128: Rasverdeling:
 128/1: - Seleksie vir vleisproduksie en vrugbaarheid by Dorperskape. 1977. P.G. Marais
 K-Kn.5: Ontwikkeling van 'n witwol-vleisskaap vir die ekstensiewe skaapweistreek. 1969. P.G. Marais
 O-Kf.19: Teling van vleisskape:
 19/1: - Seleksiestudies met Dorperskape. 1966. C.F. Sievers, J.H. Hofmeyr, C.Z. Roux
 OK-Bh.38: Teling van 'n wolvleisskaap en die inpassing daarvan by die bestaande boerderypraktyke van die kusstreek. 1959. F.O.C.W. Karberg, H.H. Barnard
 OK-Do.6: Ontwikkeling van 'n wolvleisskaap vir die suurgrasvelddele van die Oos-Kaapstreek. 1949. H.H. Barnard
 OK-Do.88: Veredeling van die Dohne-merino:
 88/1: - Kwantifisering van die teeldata en berekening van genetiese parameters vir Dohne-merino. 1979. A.J. Fourie
 88/2: - Teel en seleksie van die Dohne-merino met behulp van prestasietoesting. 1979. H.H. Barnard

VLEISPRODUKSIE/MUTTON PRODUCTION

- (A)VS-Pr.39: Geslagsfisiologie van inheemse en uitheemse manlike diere in Suid-Afrika:
 39/9: - Effect of short scrotum castration on the growth efficiency, fertility and meat production of Merino-type crossbred lambs. 1977. D. Visser
 H-BI.68: Produksie en evaluasie van wintergrane as weidingsgewasse vir die Hoëveldstreek:
 68/2: - Slaglamproduksie op wintergraanweidings in die Oos-Vrystaat. 1978. A.J. van Heerden
 H-Ps.225: Intensiewe vleisproduksie van woldraende skape:
 225/3: - Byvoeding op somerveld vir die afronding van ou ooie. 1967. D.J.Theunissen

- *225/6: - Afronding van skape op rantsoene met hoë konsentrasie mielieblaarkopmeel. 1970. P.J. Boshoff, H.J. van der Merwe
- *225/8: - Invloed van die proteïeninhoud van aanvullende konsentrate vir vroeggespeende lammers op wintergraanweiding. 1974. A.J. van Heerden
- H-Ps.232: Inkuiling en kuilvoervoeding:
- 232/17: - Verbetering in karkasgradering en winsgewendheid van slaglammers d.m.v. gedifferensieerde energie- en proteïenaanvullings tot mielies. 1977. P.J. Boshoff
- K-Gf.128: Rasverdeling:
- 128/2: - Liggaamsamestelling van Dorperskape. 1976. P.G. Marais
- N-Ce.136: Intensiewe slaglamproduksie in Natalstreek:
- 136/1: - Vergelyking van drie stelsels vir die hoë reënvalstreke. 1974. J. Grobbelaar
- 136/4: - Subnormale lutale funksionering by ooie: Na-seisoenale anestrus. 1980. J. Grobbelaar
- 136/5: - *Post partum* GnVH-behandeling en die rol van DMSG in lutale ondersteuning. 1979. J. Grobbelaar
- O-Gl.140: Geslagsfisiologiese studies met wolskape:
- *140/3: - Slaglamproduksiepotensiaal van ou Merino-ooie onder intensiewe toestande. 1975. D.W.G. Swart, O.P.J. Steyn
- W-Nt.4: Vergelyking van die groei- en slagprestasie van ooie en gekastreerde en ongekastreerde Duitse Merinolammers op die natuurlike weiding van die Nortierproefplaas. 1968. D.G.F. Labuschagne
- W-Sb.142: Slaglamproduksie in die Winterreënstreek:
- 142/1: - Slaglamproduksie in die Suid-Kaap. 1972. L.S. Erasmus

VOEDING/NUTRITION

- (A)VS-Pr.73: Doeltreffendheid van voerverbruik by plaasdiere:
- 73/10: - Invloed van voerinnamebeperking en realimentasie op die liggaamsamestelling en doeltreffendheid van voerverbruik by skape. 1978. H.H. Meissner, H.S. Hofmeyr
- O-Gl.150: Intensifisering van skaapvleisproduksie:
- 150/1: - Aanwending van geproduseerde ruvoere vir intensiewe slaglamproduksie. 1978. W.P. Auret, E.A.N. Engels

WOLSKAPE/WOOLLED SHEEP

GESLAGSFISIOLOGIE/REPRODUCTIVE PHYSIOLOGY

- K-Gf.101: - Verband tussen die intensiteit van wolproduksie en die geslagsaktiwiteit van Merino-ooie. 1962. W.J. Hugo
- K-Gf.139: Geslagsaktiwiteit van die ooi:
- 139/2: - Geslagshormoonpeile gedurende die brongstighedsiklus van die Merino-ooi in die herfs en lente. 1976. D. Wentzel
- O-Gl.140: Geslagsfisiologiese studies met wolskape:

TELING/BREEDING

- K-Gf.72: Vergelyking van verskillende seleksiemetodes met Merinoskape. 1962. J.M. Cloete

- K-Gf.75: Gelyktydige tweerigting-seleksie vir die eienskappe, wolkwaliteit en wololie by Merinoskape. 1962. J.E. Nel
- K-Gf.105: Halfklas-vaggewigstelsel as seleksiemetode by Merinoskape. 1965. J.A.A. Baard
- T-Ng.52: Intensiewe skaapproduksie:
- 52/1: - Evaluering van die Merino en sy F1-kruisings. 1969. L. Ueckermann, L. Bouwer
 - 52/2: - Evaluering van verskillende Merino F1-kruisings as moederooie vir tweede-stadium-kruisings. 1969. L. Ueckermann, L. Bouwer
 - 52/3: - Evaluering van verskillende Merino F1-kruisings met behulp van die resiproke kruisingstegniek. 1969. L. Ueckermann, L. Bouwer
- W-Eb.102: Verhoging in produksie en reproduksie van skape in die Winterreënstreek deur middel van seleksie en teling:
- 102/4: - Vergelyking van seleksieprosedure vir verhoging van fynwolproduksie by Merinoskape. 1976. J.J. du Plessis

VOEDING/NUTRITION

- K-Gf.111: Benutting van droogtevoergewasse:
- 111/8: - Skeikundige samestelling en verteerbaarheid van Oumansoutbos (*Atriplex nummularia*) soos deur skape geselekteer. 1979. G.A. Jacobs
 - 111/9: - Bepaling van optimale peile van energiebyvoeding aan lakterende ooie op Oumansoutbosbeweiding (*Atriplex nummularia*). 1978. G.A. Jacobs

PELSSKAPE/PELTED SHEEP

GESLAGSFISIOLOGIE/REPRODUCTIVE PHYSIOLOGY

- (A)VS-Pr.39: Geslagsfisiologie van inheemse en uitheemse manlike diere in Suid-Afrika:
- 39/6: - Invloed van bevriesing van Karakoelramsemen op die vrugbaarheid van die sperma. 1971. D. Visser
- O-Ut.32: Geslagsfisiologiese studies met skaaprasse:
- 32/14: - Verlaging van koste van hormoonbehandeling by skape. 1978. D.A. Boshoff
 - 32/15: - Invloed van seisoen van geboorte op puberteit, semenproduksie en LH-vlakke van Karakoelramme. 1979. A.S. Faure
 - 32/16: - Invloed van voeding en estrogen op reproduksie van jong Karakoelooie. 1979. A.S. Faure

PELSEIENSKAPPE/PELT CHARACTERISTICS

- (A)VS-Pr.81: Histologiese ondersoek na voorgeboortelike follikel- en haarontwikkeling by die Karakoellam. 1972. J.H. Dreyer

TELING/BREEDING

- O-Ut.38: Teelstudies met Karakoelskape:
- 38/1: - Ontwikkeling van 'n spesifieke grysbruin en silwerpuntige sjokoladebruin pels by Karakoelskape. 1962. D.A. Boshoff
 - 38/2: - Seleksielyne by Karakoelskape. 1963. D.J. Gouws
 - 38/5: - Effek van kruisteling op sekere kwantitatiewe en kwalitatiewe eienskappe. 1972. D.A. Boshoff

- OK-Bh.38: Teling van 'n wolvleisskaap en die inpassing daarvan by die bestaande boerderypraktyke van die kusstreek. 1959. F.O.C.W. Karberg, H.H. Barnard
- OK-Do.6: Ontwikkeling van 'n wolvleisskaap vir die suurgrasvelddele van die Oos-Kaapstreek. 1949. H.H. Barnard
- SW-GO.1: Erflikheidsberamings by Karakoelskape:
- 1/2: - Ondersoek na die metaalagtige glans by Karakoellammers. 1966. P.H. Hugo
 - 1/3: - Oorerwing van pigmentlose hare by Karakoellammers. 1967. P.H. Hugo
 - 1/4: - Seleksie vir maksimum en minimum krulontwikkeling by Karakoelskape. 1967. P.H. Hugo
- SW-GO.2: Kleurteling by Karakoelskape:
- 2/1: - Teling van grys Karakoelskape. 1973. G.J. van Zyl, D. Kotze
 - 2/2: - Ontwikkeling van 'n resessiewe wit kleur by die Karakoel. 1973. G.J. van Zyl, D. Kotze
 - 2/3: - Ontwikkeling van 'n dominante wit kleur by die Karakoel. 1973. G.J. van Zyl, G.J. Agenbag
- SW-Nd.3: Intelingstudies by Karakoelskape:
- 3/1: - Effek van inteling op verskillende eienskappe by Karakoelskape. 1967. P.H. Hugo

VOORTPLANTING/REPRODUCTION

- O-Gl.123: Doeltreffende benutting van natuurlike veld in die O.V.S.-streek:
- 123/7: - Invloed van fosfor op die reproduksie van Karakoelooie. 1979. A.S. Faure
- SW-Kh.1: Reproduksiestudies met Karakoelskape:
- 1/1: - Ondersoek na dekseisoene by Karakoelskape op die Kalahariproefplaas. 1965. P.J. le Roux, G.J. Agenbag
 - 1/8: - Bepaling van die tyd van ovulasie by Karakoelooie. 1972. L.C. van Wyk, P.J. le Roux
- SW-Nd.1: Invloed van voeding op die reproduksie-eienskappe:
- 1/4: - Invoer van speenouderdom op groei en puberteit van Karakoellammers en herbesetting van die ooie. 1971. P. J. le Roux

SKAPE ALGEMEEN/SHEEP GENERAL

VOEDING/NUTRITION

- (A)VS-Pr.26: Stikstofmetabolisme by herkouers:
- *26/6: - Use of starea as only nitrogen supplement in a production diet. 1977. W.D. Basson
 - 26/9: - Effect of ammonia concentration in rumen fluid on the flow of crude protein to the duodenum. 1977. P.J.K. Morgan, W.D. Basson, E.B. Spreeth
- (A)VS-Pr.73: Doeltreffendheid van voerverbruik by plaasdiere:
- 73/10: - Invloed van voerinnamebeperking en realimentasie op die liggaamsamestelling en doeltreffendheid van voerverbruik by skape. 1978. H.H. Meissner, H.S. Hofmeyr
- (A)VS-Pr.93: Evaluation and improvement of energy supply in low quality roughages and by-products available for ruminant nutrition in South Africa:
- *93/3: - Intake and parameters related to the partial digestion of NaOH treated kikuyu in lambs. 1975. P.J.K. Morgan, J.P. Pienaar

- 93/4: - Waarde van NaOH-behandelde koringstrooi in terme van mieliemeel in groeirantsoene vir lammers. 1976. T.H. Jansen, H.S. Hofmeyer
- H-Ps.225: Intensiewe vleisproduksie van woldraende skape:
- 225/4: - Byvoeding op somerveld aan lakterende ooie. 1970. D.J. Theunissen
- H-Ps.232: Inkuiling en kuilvoervoeding:
- *232/4: - Byvoeging van melasse, mieliemeel en ureum by inkuiling op die kwaliteit van mieliekuilvoer. 1969. C.W. Cruywagen
- K-Gf.89: Kunsmatige en byvoeding van skape in die Karoostreek:
- *89/11: - Invloed van die kragvoer:ruvoerverhouding van die rantsoen op die vetmesting van ou Merinoskape. 1967. F.C. Hayward
- K-Gf.115: Studies oor droogtevoeding van skape in die sentrale Karoo:
- *115/4: - Effek van voedingspeil op die produksie en reproduksie van Merino-ooie. 1969. J.G. Cloete
- K-Kn.3: Droogtevoedingstudies met skape in die noordwestelike Karoo:
- 3/1: - Vasstelling van moontlike energie- en/of proteïentekorte van verskillende veldsoorte. 1966. J.G. Cloete
- N-Ce.105: Feeding of sheep on artificial grazing in the mistbelt of Natal:
- N-Ko.4: Investigation of the advantages and problems associated with spring and autumn mating of ewes in East Griqualand:
- 4/5: - Nutrition of the autumn lambing ewe six weeks before lambing. 1976. A.D. Lyle, G.J. Muller
- N-Ko.5: Production systems for beef cattle and sheep in East Griqualand:
- 5/6: - Influence of phosphorus supplementation in a Merino lambing flock. 1976. A.D. Lyle, G.J. Muller
- O-Gl.125: Evaluering van die voedingswaarde van ruvoere en weidings:
- *125/6: - Voedingswaarde van bemeste en onbemeste hooie vir skape. 1965. J.A. Swart, E.A.N. Engels, B. Ferreira
- 125/8: - Droëmateriaalinname van vryweidende skape op veldweidings. 1966. E.A.N. Engels, A. van Schalkwyk, A. Malan, B. Ferreira
- 125/15: - Bepaling van die voedingswaarde van sekere aangeplante winter- en somerweidings vir skape. 1969. E.A.N. Engels, J.A. Swart, A. Malan, B. Ferreira
- 125/18: - Evaluering van die voedingswaarde van veldweiding van Koopmansfontein. 1973. E.A.N. Engels, B. Ferreira
- 125/23: - Invloed van proteïenaanvulling deur die jaar op die selektiewe weigewoonte en voerinname van vryweigewoonte en voerinname van vryweidende skape. 1977. H.O. de Waal, E.A.N. Engels, L.C. Biel
- 125/26: - Invloed van verskillende peile van proteïen- en energieaanvullings aan vryweidende lakterende skaapooie op die prestasie van die ooie en hul lammers. 1980. H.O. de Waal
- N-Ce.112: Oorwintering van skape in die Natalse misgordel:
- 112/3: - Inkuiling van kikoejoe vir wintervoeding van skape. 1970. S.F. Lesch, B.P. Louw
- W-Tk.3: Evaluasie van weidingsgewasse en skaapbestuurspraktyke in die Winterreënstreek:
- 3/9: - Studie van mineraaltekkorte en -aanvullings by skape op aangeplante weidings in George-omgewing. 1977. N.M. Kritzinger

VOORTPLANTING/REPRODUCTION

- OK-Do.64: Oorwintering van lammerooie in die suurgrasveld van die Oos-Kaapstreek:
- 64/7: - Effect of feeding laying hen manure on the reproduction of ewes. 1970. S.W. Bosman
- 64/8: - Invloed van veldkwaliteit en hoë proteïenaanvulling op die produksie van lammerooie. 1972. H.H. Barnard
- T-Ng.52: Intensiewe skaapproduksie:
- 52/6: - Geslagsaktiwiteit van uitheemse skaaprasse en kruisings met die Merino-ooi. 1972. H. Steynberg, L. Ueckermann, L. Bouwer
- T-Rp.25: Effek van energie, proteïen- en nie-proteïenstikstof op die aantelvermoë van ooie. 1970. G. Marincowitz
- W-Eb.102: Verhoging in produksie en reproduksie van skape in die Winterreënstreek deur middel van seleksie en teling:
- 102/5: - Ondersoek na die plasma-luteïniserende hormoonkonsentrasie (LH) voor puberteit as 'n vroeë seleksiemaatstaf van vrugbaarheid en fekunditeit by skape. 1977. N.M. Kritzinger
- W-Sb.142: Slaglamproduksie in die Winterreënstreek:
- 142/2: - Versnelde paringsfrekwensie met skape: 'n Vergelyking van twee bestuurstelsels vir produksie van slaglammers. 1979. L.S. Erasmus

KLEINVEE/SMALL STOCK

VOEDING/NUTRITION

- K-Gf.129: Voedingswaarde van Karooweidings:
- 129/3: - Vrywillige inname, verteerbaarheid en chemiese samestelling van Karooveld soos deur kleinvee geselekteer. 1973. P.J.L. Zeeman
- K-Gf.141: Ontwikkeling en implementering van simulasiemodelle van landbou-ekosisteme:
- 141/1: - Model vir die bepaling van die voedingsbenodigdhede van kleinvee in die Karoo. 1977. O. Bosch

SYBOKKE/ANGORA GOATS

GESLAGSFISIOLOGIE/REPRODUCTIVE PHYSIOLOGY

- K-Gf.139: Geslagsaktiwiteit van die ooi:
- 139/1: - Geslagshormoonpeile gedurende die brontigheidsiklus van die Angorabokooi. 1976. D. Wentzel
- 139/3: - Verwantskap tussen hormoonpeile van die Angoraboklam en die daaropvolgende reproduksiepotensiaal van die ooi. 1976. D. Wentzel
- K-Gf.140: Geslagsaktiwiteit van die ram:
- 140/1: - Hormoonpeil van die Angorabokkram gedurende periodes van hoë en lae geslagsaktiwiteit. 1977. J.H.P. van der Merwe

TELING/BREEDING

- K-Gf.104: Verbetering van die Angorabok deur teling:

- 104/1: - Seleksie vir vageienskappe en vrugbaarheid by die Angorabok. 1976. J.M.P. van der Merwe
- 104/3: - Ouderdomseffekte op die produksie en gehalte-eienskappe van bokhaar. 1978. J.J. Venter, L. de W. Louw

VOEDING/NUTRITION

- K-Gf.131: Kunsmatige byvoeding:
- 131/2: - Vetmesting van Angorabokke. 1976. G.A. Jacobs
- K-Gf.138: Perinatale verliese by kleinvee:
- *138/4: - Invloed van die peil van energie- en proteïenvoeding op perinatale verliese, laktasie en groei van lammers by Angorabokke. 1976. L. de W. Louw

VOORTPLANTING/REPRODUCTION

- K-Gf.138: Perinatale verliese by kleinvee:
- 138/1: - Endokrinologiese studies van aborsie by Angorabokke. 1973. D. Wentzel
- 138/2: - Invloed van energievoeding op aborsie by die Angorabok. 1975. D. Wentzel
- 138/3: - Invloed van koue op aborsie by Angorabokke. 1976. D. Wentzel

VLEISBOKKE/MEAT GOATS

- (A)VS-Pr.39: Geslagsfisiologie van inheemse manlike diere in Suid-Afrika:
- 39/7: - Bevriesing van Boerboksemen. 1974. D. Visser

MELKBOKKE/MILCH GOATS

- (A)VS-Pr.26: Stikstofmetabolisme by herkouters:
- *26/8: - The influence of feed intake on the utilization of protein sources in the rumen and lower digestive tract in the milk goat. 1977. W.D. Basson, L.H.P. Liebenberg, P.J.K. Morgan

VARKE/PIGS

BEDRYFSONDERSOEK/ENTERPRISE INVESTIGATION

- (A)VS-Pr.42: Voeding en versorging van die jong varkie:
- 42/2: - Invloed van speenouderdom van 'n sog se werpsels op haar lewensproduktiwiteit. 1970. E.H. Kemm

GESLAGSFISIOLOGIE/REPRODUCTIVE PHYSIOLOGY

- (A)VS-Pr.100: Reproduction potential of the prepubertal gilt:
- 100/2: - Effect of season, birth and related factors on the incidence of puberty in gilts. 1977. A.R. Gee, D. Visser, Erna Dierkse
- (A)VS-Pr.107: Artificial insemination in the pig:
- 107/1: - Motility and fertility of liquid stored semen. 1979. A.R. Gee

SIEKTES/DISEASES

- (A)VS-Pr.41: Verwantskapstudies van bloed- en serumfaktore (geneties) met ekonomiese belangrike produksie- en reproduksie-eienskappe by plaasdiere en verwante spesies:
- 41/2: - Immunogenetiese en serologiese merkers en hulle verband met produksiefaktore by varke. 1967. E.H.H. Meyer

VOEDING/NUTRITION

- (A)VS-Pr.67: Evaluering en standaardisering van varkrantsoene onder Suid-Afrikaanse toestande:
- *67/3: - Invloed van rantsoen-energiekonsentrasie, gevoer teen 'n voldoende proteïeninhoud, op die groeitempo, liggaamsamestelling en voedselkomponentbenutting by groeiende varke. 1975. E.H. Kemm
- *67/4: - Kwantifisering van die effekte van nat teenoor droë voeding op die groeiende vark. 1976. F.K. Siebrits
- 67/5: - Gebruik van formaldehyd-behandelde voëlproef-graansorghum in 'n varkgroeimeel. 1978. E.H. Kemm, F.K. Siebrits, M.N. Ras, C.Z. Roux
- (A)VS-Pr.87: Chemiese en biologiese evaluasie van proteïenbronne:
- *87/4: - Bepaling van optimale insluitingspeile van sonneblomoliekoekmeel in varkgroeidiëte. 1978. F.K. Siebrits, E.H. Kemm, G.A. Smith, M.N. Ras
- 87/6: - Bepaling van optimale insluitingspeile van proteïenbronne in varkgroei- en afrondingsdiëte. 1979. E.H. Kemm, F.K. Siebrits, M.N. Ras
- 87/7: - Waardebepaling van gedehidreerde lusernmeel as dieetkomponent vir gebruik in varkdiëte. 1979. E.H. Kemm, F.K. Siebrits, M.N. Ras
- W-Eb.101: Voeding en behuising van varke in verskillende lewens- en produksiestadia in die Winterreënstreek:
- 101/4: - Optimal fish meal levels in diets for growing pigs. 1978. N.M. Kritzinger
- 101/5: - Evaluasie van viskuil as 'n proteïenbron in die diëte van groeiende varke. 1979. N.M. Kritzinger
- 101/6: - Evaluasie van wyngis as 'n proteïenbron in die diëte van groeiende varke. 1979. N.M. Kritzinger

PLUIMVEE/POULTRY

EENDE/ DUCKS

VOEDINGSWAARDE/NUTRITIONAL VALUE

- (A)VS-Pr.92: Suitability of a Hagedoorn breeding programme for improving productivity in Pekin ducks:
- 92/2: - Rearing ducks on a controlled feed intake regime and the result on their subsequent productive performance. 1974. M.D. Olver

GANSE/GEESE

VOEDING/NUTRITION

- (A)VS-Pr.91: Nutritional requirements for growth of Chinese geese:
- 91/1: - Requirements in respect of proteins, fibre and energy. 1965. M.D. Olver

HOENDERS/FOWLS

TELING/BREEDING

- (A)VS-Pr.82: Teling en verbetering van pluimvee vir eierproduksie:
- 82/1: - Teling van voortreflike lêrasse met geslagsgekoppelde veerkleur. 1970. C.L. Marais
 - 82/2: - Teling van voortreflike lêrasse met rooi en goud veerkleur. 1970. C.L. Marais
 - 82/3: - Genetiese kombineervermoë van hoenderrasse en -bloedlyne. 1970. W.C. Viljoen, C.L. Marais, J.J. Joubert
 - 82/4: - Teling en seleksie van die Australorp vir eierproduksie en -gehalte. 1967. C.L. Marais
 - 82/5: - Teling van die Minorca-hoenderras as 'n bron van genetiese materiaal. 1970. C.L. Marais
 - 82/7: - Teling van 'n voortreflike outoseks-hoenderras. 1973. C.L. Marais, J.J. Joubert, J.J. Gregorowski
 - 82/8: - New Hampshire genetiese kontroletrop. 1976. J.J. Joubert
- (A)VS-Pr.96: Kwantitatiewe oorerwing by pluimvee:
- 96/1: - Genotipe-omgewingswisselwerking. 1975. J.J. Joubert, J.J. Gregorowski
- (A)VS-Pr.97: Teling en verbetering van slagpluimvee:
- 97/1: - Teling van braaikuiken-haanlyne. 1962. J.J. Joubert
 - 97/2: - Teling van braaikuiken-henlyne. 1962. J.J. Joubert
 - 97/3: - Braaikuiken-haanelyn genetiese kontroletrop. 1975. J.J. Joubert
 - 97/4: - Braaikuiken-henlyn genetiese kontroletrop. 1975. J.J. Joubert

VOEDING/NUTRITION

- (A)VS-Pr.98: Voeding van pluimvee:
- 98/1: - Invloed van verskillende peile van vismeel op die eierproduksie van lêhenne. 1976. J. Erasmus
 - *98/2: - Invloed van beperkte voerinname op eierproduksie, karkassamestelling en gehalte van eiers van eiertipe henne. 1977. L.J. Steenkamp, J. Erasmus
 - 98/3: - Effek van lêrantsoene met verskillende peile van fosfor op aantal, grootte en gehalte van eiers. 1977. J. Erasmus, J.J. Gregorowski

VOLSTRUISE/OSTRICHES

BESTUUR/MANAGEMENT

- W-Sb.144: Volstruisproduksie:
- 144/3: - Invloed van die volstruis as weidende dier op lusern. 1973. C.J. Nel

PRODUKSIE/PRODUCTION

- W-Oh.8: Kuddegemiddelde- en produksierekords binne 'n geslote volstruispopulasie:
- 8/2: - Ondersoek na die variasie in getal vlerkpluime (witvere) by volstruise. 1976. D. Swart
 - 8/3: - Volstruisvelle en leerkwiteit. 1977. D. Swart

- W-Sb.144: Volstruisproduksie:
- 144/2: - Situatiebepaling. 1973. C.J. Nel
 - *144/4: - Dosering van volstruise. 1974. C.J. Nel

SELEKSIESTUDIES/SELECTION STUDIES

- W-Oh.8: Kuddegemiddelde- en produksierekords binne 'n geslote volstruispopulasie:
- 8/1: - Kuddegemiddeldes binne 'n geslote volstruispopulasie, interpretasie daarvan en beraming van moontlik genetiese parameters vir toekomstige nageslag. 1974. D. Swart
 - 8/4: - Studie van sekere veereienskappe by volstruise. 1978. D. Swart

WILD/GAME

PRODUKSIE/PRODUCTION

- SW-Om.1: Wildinskakeling by ekstensiewe veeboerdery:
- 1/1: - Produksiepotensiaal van sekere wildsoorte op die Omatjenneproefplaas. 1970. J.P. van Niekerk, J.A.J. van Eck

PERDE/HORSES

TELING/BREEDING

- T-Ng.16: Nooitgedacht indigenous saddle-horse stud. 1951. D.W. Eden

ALGEMEEN/GENERAL

BEDRYFSONDERSOEK/ENTERPRISE INVESTIGATION

- N-Ko.5: Production systems for beef cattle and sheep in the East Griqualand area:
- 5/4: - Growth of young cattle and sheep managed on a preference and follower herd basis within a rotational grazing system on summer veld. 1972. A.D. Lyle, R.M. Bredon, G.M. Brockett

PRODUKSIE/PRODUCTION

- T-Rp.30: Produksievermoë van vee op optimaalbestuurde veld:
- 30/2: - Produksievermoë van skape en bokke op *Acacia*-grasveld in die Suurbosveld. 1972. G. Marincowitz, J.G. Low, K.E. Oosthuizen
 - 30/6: - Produksievermoë van skape, beeste en bokke op *Acacia*-grasveld in die Suurbosveld. 1972. G. Marincowitz, J.G. Low, K.E. Oosthuizen

SITOGNETIKA/CYTOGENETICS

- *(A)VS-Pr.23: Kariotiepstudies van die skaap (en die bees). 1965. E.H.H. Meyer

TELING/BREEDING

- (A)VS-Pr.103: Breeding and maintenance of small animals for experimental purposes:
- 103/1: - Investigation into breeding techniques and the suitability of various species for biological research. 1976. Z. Earl

- (A)VS-Pr.104: Gebruik van laboratoriumdiere as biologiese modelle vir dierteeltprobleme:
 *104/1: - Kwantifisering van groei en doeltreffendheid van voerverbruik vir seleksiedoeleindes by *Rattus domesticus*. 1977. M.M. Scholtz
- (A)VS-Pr.105: Evaluation and application of techniques for cytogenetic screening of farm animals:
 105/1: - Cytogenetic screening of cattle. 1978. E.H.H. Meyer, E.J. Harris

VLEISPRODUKSIE/MEAT PRODUCTION

- (A)VS-Pr.76: Kwantitatiewe en kwalitatiewe vleisproduksiestudies:
 76/2: - Liggaamsgroei, -samestelling en -bouvorm van skape en bokke. 1971. R.T. Naudé
 76/10: - Verkoeling van beeskarkasse. 1976. R.T. Naudé
 76/11: - Objektiewe ontleding van die huidige karkasgraderingstelsel. 1976. J.F.G. Klingbiel
- T-Mr.15: - Bestendige vleisproduksiestelsel vir die mopanieveld. 1968. J.F.G. Badenhorst, H.P. Eloff, C.J.F. Lüdemann, E.E. Lademan

WEIGEWONTES/GRAZING HABITS

- K-Gf.127: Weigewoontes:
 127/1: - Selektiewe weigewoontes van skape, beeste en bokke. 1973. P. Botha

Diereprodukte/Animal Products

VLEIS/MEAT

- (A)VS-Pr.108: Ondersoeke na die rakleef tyd van vleis:
 108/1: - Ondersoeke na die invloed van abattoirprosesse en koelopberging op die mikrobevolking op karkasse. 1979. G.L. Nortjé

MELK/MILK

- (A)VS-Pr.18: Studie van die variasie van melk- en bottervetproduksie in Suid-Afrika:
 18/1: - Bronne van genetiese variasie. 1965. G.P. Kühn
 18/2: - Bronne van nie-genetiese variasie. 1965. G.P. Kühn
- (A)VS-Pr.28: Quality of milk or cream with regard to its bacteriological composition:
- (A)VS-Pr.45: Hulpmiddels en geriewe in die produksie van melk of room. 1975
- (A)VS-Pr.46: Quality of milk or cream in respect of chemical composition:
 46/1: - Photometric method (Milkotester) for determining the fat and protein content of milk. 1973. H. Lück
 46/3: - Gehalte van die verskillende proteïenfraksies in melk onder sekere gekontroleerde kuddetoestande. 1974. D.J. de Lange
 46/6: - Bepaling van aminosure met behulp van gaschromatografie. 1975. D.J. de Lange
 46/8: - Determination of the fat, protein and lactose content of 10-day preserved samples by means of the infra-red milk analyser. 1975. H. Lück
- (A)VS-Pr.47: Cooling and transport of milk and cream:
 47/1: - Performance tests on air eliminators for bulk milk collection. 1978. J.B. Joubert

- (A)VS-Pr.55: Verwerking en vervaardiging van newe- en ander suiwelprodukte:
- 55/2: - Tegniekstudies in die konsentrering van afgeroomde melk deur middel van ultrafiltrasie. 1972. J.H. Labuschagne
 - 55/3: - Aanwending van die herwonne bestanddele deur ultrafiltrasie in suiwelprodukte. 1972. J.H. Labuschagne, D.J. de Lange
 - 55/4: - Fermentasie van wei vir die produksie van proteïene. 1978. J.J. Keller
 - 55/5: - Ontledingskontroletoetse gedurende ultra-filtrasie van melk en wei. 1978. J.A. Nieuwoudt, L.E. Smit
- (A)VS-Pr.58: Storage and marketing of milk and cream:
- 58/1: - Increase in temperature of milk during delivery to consumers. 1970. J.H. Labuschagne
 - 58/3: - Identifikasie van spoorvormende bakterieë uit ultra-hoë temperatuur behandelde en gesteriliseerde melk. 1978. J.F. Mostert
 - 58/4: - Bakteriologiese gehalte van U.H.T. behandelde melk. 1978. H.Lück

SUIWELPRODUKTE/DAIRY PRODUCTS

BOTTER/BUTTER

- (A)VS-Pr.30: Opberging en bemarking van botter:
- 30/9: - Metode vir die bepaling van diasetie en asetoin in aromabotter. 1974. J.A. Nieuwoudt
- (A)VS-Pr.52: Manufacture of butter:
- 52/1: - Manufacture of cultured cream butter. 1975. J.H. Labuschagne

HIGIËNE/HYGIENE

- (A)VS-Pr.65: Gesondheidsaspekte in die verbruik van suiwelprodukte:
- 65/1: - Bepaling van chloorbevattende insektmiddels in in suiwelprodukte. 1972. D.J. de Lange
 - 65/2: - Mycotoxins in South African dairy products. 1978. H. Lück

KAAS/CHEESE

- (A)VS-Pr.32: Vervaardiging van kaas:
- 32/6: - Verkorting van die vervaardigingsproses van Cheddarkas. 1978. J.H. Labuschagne, J.A. Nieuwoudt
 - 32/8: - Study of the propionic acid bacteria in Gouda cheese. 1972. T.J. Britz
 - 32/9: - Studies in verband met die insout van Goudakaas in pekeloplossing. 1972. G. Vaandrager
 - 32/10: - Bakteriologiese samestelling van kommersiële suursels vir Goudakaasvervaardiging. 1978. J.F. Mostert
 - 32/13: - Invloed van oorripping van melk op die bakteriese gehalte en kwaliteit van Goudakaas. 1977. J.C. Meurs
 - 32/14: - Study of the *Pediococci* in South African Gouda cheese. 1973. Barbara Statina
- (A)VS-Pr.59: Opberging en bemarking van kaas:
- 59/2: - Maatstawwe om die graad van rypheid van kaas te bepaal. 1975. J.A. Nieuwoudt
 - 59/3: - Characteristics of an anomalous gas-forming organism isolated from cheese. 1975. J. Walthew

KONSENTRATE/CONCENTRATES

- (A)VS-Pr.53: Vervaardiging van gekonsentreerde melkprodukte:
- 53/1: - Hygienic quality of milk powder. 1978. H. Lück, H.F. du P. Jordaan
 - 53/2: - Vibrating tube method for the determination of the density of condensed milk. 1978. J.H. Labuschagne, J.C. Pelster, L.E. Smit

MAGOU

- (A)VS-Pr.55: Vervaardiging van newe- en ander suiwel-produkte:
- 55/6: - Enkele aspekte aangaande die bereiding van magou. 1978. J.B. Kriel

MIKROBIOLOGIE/MICROBIOLOGY

- (A)VS-Pr.54: Vervaardiging van kultuur-, bevrore en gekeurde melkprodukte:
- 54/4: - Study of the technology of starter culture manufacture and preservation. 1972. J.B. Kriel
 - 54/7: - Bakteriofaagtipering van melksuurtstreptococci. 1972. J.B. Kriel
 - 54/9: - Taksonomiese studie van *Streptococcus diacetilactis* en die praktiese belang daarvan vir die suiwelbedryf. 1974. J.F. Mostert
 - 54/10: - Kweek en hantering van kaassuurselkulture. 1975. J.B. Kriel, L.A. Wood
 - 54/12: - Propionic acid bacteria strain selection by means of the amino acid and sugar composition of the cell wall. 1975. T.J. Britz

ALGEMEEN/GENERAL

- (A)VS-Pr.64: Gebruik van suiwelprodukte by menslike voeding:
- 64/1: - Vergelykende studie van botter en margarien ten opsigte van hul vetsuurinhoud. 1972
 - 64/2: - Goedhouvermoë van bederfbare suiwelprodukte. 1978. H. Lück, J.F. Mostert

WOL/WOOL

HISTOLOGIE/HISTOLOGY

- T-Ng.52: Intensiewe skaapproduksie:
- 52/4: - Histologiese evaluasie van vel en vesel by ouerrasskape. 1971. J.H. Dreyer, M.R. Schwellnus
 - 52/5: - Evaluering van vel en vesel van Merino F1-kruisings. 1972. J.H. Dreyer, M.R. Schwellnus

KWALITEIT/QUALITY

- K-Gf.118: Gehaltestudies by wol:
- 118/2: - Verwerking van wol geproduseer in verskillende boerderygebiede van die Karoostreek. 1976. J.J. Venter
 - 118/4: - Gehalteverskille tussen ondergekartelde, Duerdengetroue en oorgekartelde wol. 1978. P.D. Grobbelaar

Ondersteunende Navorsing/Supporting Research

VEEVOER/FODDER

- (A)PS-Pr.35: Studies oor toksigene swamme in veevoere:
- (A)VS-Pr.73: Doeltreffendheid van voerverbruik by plaasdiere:
- 73/11: - Bestudering van vrywillige inname van voermengsels. 1979. H.H. Meissner, C. Roux, J.P. Pienaar
- (A)VS-Pr.74: Benutting van *Zea mays* deur herkouers:
- 74/5: - Mielies op verskillende wyses geprosesseer as energie-aanvulling vir medium kwaliteit hooi. 1979. H.H. Meissner, L.H.P. Liebenberg
- 74/6: - Kwantifisering van die ruvoereienskappe van verskillende ruvoerbronne in hoë melie-afrondingsrantsoene. 1979. H.H. Meissner, J.P. Pienaar
- (A)VS-Pr.87: Benutting van proteïenbronne in die Republiek van Suid-Afrika:
- 87/1: - Chemiese en biologiese evaluasie van proteïenbronne. 1973. G.A. Smith
- 87/5: - Ondersoek na die kwaliteit van plaaslik vervaardigde bloed- en karkasmeel. 1978. G.A. Smith
- (A)VS-Pr.93: Evaluering en verbetering in energievoorsiening van laegehalte voere en veselryke afvalprodukte beskikbaar in Suid-Afrika vir herkouervoeding:
- *93/1: - *In vitro* verteerbaarheid van organiese stof in laegehalte voere en veselryke afvalprodukte in Suid-Afrika na behandeling met verskillende konsentrasies natriumhidroksied. 1974. H.S. Hofmeyr
- 93/5: - Inkuiling van braaikuikenmis. 1978. L.H.P. Liebenberg
- 93/6: - Bepaling van die voedingswaarde van die verskillende fraksies van die volwasse droë melieplant voor en na behandeling met bytsoda. 1979. T.H. Jansen, H.H. Meissner, J.P. Pienaar, L. Grattarola
- *H-Ps.71: Bepaling van die voedingswaarde van Suid-Afrikaanse voergewasse. 1944. R.H. Drewes
- N-Ce.123: Economic and technical aspects of milk production on pastures in Natal:
- 123/3: - Chemical composition and nutritive value of kikuyu (*Pennisetum clandestinum*) pasture throughout the grazing season in bioclimatic group III - Mistbelt. 1972. R.M. Bredon, J.H. du Toit
- N-Ce.150: Analytical evaluation of feedstuffs in the Natal Region:
- 150/1: - Correlation between *in vitro* rate of digestion of feeds and animal performance. 1978. J.P. Marais, M.D.C. Dos Anjos Santos
- 150/2: - Evaluation of ruminant feedstuffs by analysis of the products of artificial rumen digestion. 1978. C. Dennison
- 150/3: - Effect of N-fertilization, legume-N and height of cutting on the quality and nitrogen content of kikuyu pastures and the effect thereof on animal production. 1978. J.P. Marais, J.H. du Toit, C.I. McDonald
- W-Eb.105: Voedingswaarde van veevoere en weidings in die Winterreëng gebied:
- 105/1: - Voedingswaarde van *Osteospermum sinuatum* (bitou) en *Eriocephalus umbellatus* (Rosemaryn) op twee verskillende groeistudies. 1977. J. Coetzee

DIEREGESONDHEID/ANIMAL HEALTH

Veeartsenykunde/Veterinary Science

BEESTE/CATTLE

BAKTERIEë/BACTERIA

- OP-BACT.59: Praktiese metode vir die massaproduksie van *Campylobacter fetus*. 1976. A.D. Botha

BOSLUISE/TICKS

- OP-ENT.20: Genetical studies on *Boophilus* spp. 1973. A.M. Spicket

HIGIëNE/HYGIENE

- OP-HYG.25: Normale bakterieflora op koeie se uiers en die variasie daarvan m.b.t. ouderdom, soort en seisoen. 1979. A.M. du Rand

INSEKTEPLAE/INSECT PESTS

- OP-ENT.33: Laboratory studies on the bionomics of muscid flies associated with cattle, with special reference to the subgenus *Eumusca*. 1980. B. Sutherland

- OP-HELM.23: Morfogeenese van inwendige parasiete van beeste. 1971. A. Verster

OORERFLIKE LAMINITIS/HEREDITARY LAMINITIS

- (A)VS-Pr.24: Erflike gebreke en afwykings by plaasdiere:
 24/1: - Studie van oorerflike laminitis by Jerseybeeste. 1965. E.H.H. Meyer
 (A)VS-Pr.34: Laminitis by Afrikanerbeeste:
 34/1: - Studie van oorerwing van laminitis by Afrikanerbeeste. 1971. E.H.H. Meyer

PROTOZOë/PROTOZOA

- OP-PROT.13: Studies on the possible presence of a gut phase in the life cycle of *B. besnoite*. 1970. S.E. Thomas, R.D. Bigalke
 OP-PROT.22: Epidemiological study of bovine babesiosis. 1979. A.J. de Vos
 OP-PROT.24: Identity, distribution and transmission of *Theileria* spp. in South Africa. 1977. A.J. de Vos
 OP-PROT.27: Kruisimmunitet tussen *B. bigemina* en *B. bovis*. 1979. J.H. Schoeman, A.J. de Vos

REPRODUKSIE/REPRODUCTION

- OP-REP.14: Ondersoek na die etiologie van die sg. "Epivag"-sindroom van beeste. 1974. C.J.V. Trichardt, A. Theodoridis, J.A.W. Coetzer, M.M. Henton, E.S. Miller
 OP-REP.15: Oorsaak van fetale afsterwe by herkouers. 1978. C.J.V. Trichardt

RICKETSIA

- OP-PATH.41: Duur van immuniteit teen hartwater in beeste en die invloed van serum-inhibeerders daarop. 1976. J.L. du Plessis, J.D. Bezuidenhout

VERGIFTIGING/POISONING

- OP-TOX.27: Tremorgene mikotoksiene uit *Aspergillus olavatus*. 1976. L.A.P. Anderson
- OP-TOX.28: Behandeling van tulp- en ander hartglikosied-vergiftigings. 1979. J.P.J. Joubert
- OP-TOX.29: Voorkoming van tulp- en ander hartglikosied-vergiftigings. 1979. J.P.J. Joubert

VIRUSSE/VIRUSES

- OP-MOL.45: Invloed van die vlak van konglutiniene in die serum van 2-6 maande oud kalwers op hul vatbaarheid vir hartwater. 1979. J.L. du Plessis
- OP-MOL.46: Aard en duur van immuniteit teen hartwarter in beeste geïmmuniseer as kalwers. 1979. J.L. du Plessis, J.D. Bezuidenhout
- *OP-PATH.40: Effek van Wesselsbronnvirus op die dragtige koei en foetus. 1976. J.A.W. Coetzer, A. Theodoridis
- OP-PATH.52: Knopvelsiekte: 'n Elektronmikroskopiese ondersoek. 1978. L. Prozesky, B. Barnard
- OP-VIR.46: Application of the fluorescent antibody technique for the diagnosis of Wesselsbronn and Rift Valley fever viruses. 1976. R.H. Murray, A. Theodoridis

SKAPE/SHEEP

BAKTERIEË/BACTERIA

- OP-BACT.63: Immuun-kompetensie van die ram en ooi se urino-genitale stelsel teenoor *Actinobacillus seminis*. 1979. B.C. Jansen
- OP-BACT.64: Histopatologie en plasing van die kieme in *Actinobacillus seminis*-besmetting. 1979. B.C. Jansen, E.M. van Tonder
- OP-BACT.66: Ontwikkeling van 'n effektiewe geïnaktiveerde entstof teen *Clostridium perfringens*. 1979. M.W. Odendaal
- OP-BACT.67: Studie om 'n kwantitatiewe vergelyking van die toksienproduksievermoë van 'n aantal *Clostridium perfringens*-isolate te bepaal. 1979. M.W. Odendaal
- OP-DMR.66: Numbers and types of fibre-digesting bacteria in the rumens of sheep fed maize straw and increasing amounts of maize grain and their relation to the digestion of cellulose and hemicellulose. 1979. Y. van der Linden, N.O. van Gylswyk, H.M. Schwartz

BIOCHEMIE/BIOCHEMISTRY

- OP-DMR.16: Factors influencing the utilization of urea by ruminal ingesta from sheep *in vivo* and *in vitro*. 1968. H.M. Schwartz
- OP-DMR.57: Determination of extracellular fluid and plasma volumes of Merino sheep before and after a glucose tolerance test. 1976. J.G. van der Walt

INWENDIGE PARASIEË/INTERNAL PARASITES

- OP-HELM.24: Morfogeenese van inwendige parasiete van skape. 1971. A. Verster

MOLEKULÊRE BIOLOGIE/MOLECULAR BIOLOGY

- OP-MOL.42: Studie van die nie-kapsied-proteïene in bloutongvirus-besmette selle. 1976. H. Huisman, C.W. Bremer

- OP-MOL.43: Further biochemical and genetic studies of temperature-sensitive mutants of blue tongue virus. 1977. S.O. Shipman
- OP-MOL.44: Invloed van Gloxazone op die immuniteit van skape teen hartwater. 1978. J.L. du Plessis

PATHOLOGIE/PATHOLOGY

- OP-PATH.50: Teratology in sheep associated with the treatment of pregnant ewes with parabendazole. 1978. L. Prozesky, J.P.J. Joubert
- OP-PATH.51: Ultrastrukturele patologie; patogenese chemiese patologie en haematologie in pasgebore lammers besmet met slenkalkoors. 1978. J.A.W. Coetzer, A. Theodoridis

RICKETSIA

- OP-MOL.44: Invloed van gloxazone op die immuniteit van skape teen hartwater. 1978. J.L. du Plessis

VERGIFTIGING/POISONING

- OP-TOX.16: Lupinose II. Giftige metaboliet van *Phomopsis leptostromi formis* (Kühn). 1970. L.A.P. Anderson, T.S. Kellerman, T.W. Naudé, I.B.J. van Rensburg, C.H. van Aswegen
- OP-TOX.17: Fotosensitisasie in SA III: Die rol van mikrotoksene in die aetiologie van geeldikkop. 1971. T.S. Kellerman, J.A.W. Coetzer, P.A. Basson

VIRUSSE/VIRUSES

- *OP-BIO.27: Hemaglotinasie en homagglutinasie-inhibisie by bloutongvirus. 1978. N.T. van der Walt
- OP-PATH.39: Patologiese en virologiese studies op Wesselsbronsiekte in volwasse skape en bokke. 1976. J.A.W. Coetzer, A. Theodoridis
- OP-PATH.42: Effect of Wesselsbron virus on the pregnant vervet monkey and its developing foetus. 1977. A.F. van Dellen, J.A.W. Coetzer, A. Theodoridis, A. De Vos
- OP-NUT.12: Effek van sulfaat in die drinkwater van skape. 1977. J. de V. du Toit, E.L. Barrett

VOORTPLANTING/REPRODUCTION

- OP-PATH.50: Teratology in sheep associated with the treatment of pregnant ewes with parabendazole. 1978. L. Prozesky, J.P.J. Joubert
- OP-VIR.15: Immunisation of sheep with blue tongue virus modified in tissue culture. 1979. B.J. Erasmus
- OP-VIR.35: Enzootic abortion in ewes. 1979. B.J.H. Barnard

BOKKE/GOATS

INWENDIGE PARASIEDE/INTERNAL PARASITES

- OP-HELM.26: Vatbaarheid van bokke vir besmetting met *Coenrus cerebralis*. 1979. A. Verster, R.Tustin

PERDE/HORSES

INSEKTEPLAE/INSECT PESTS

OK-Do.75: Control of the stable fly, *Stomoxys calcitrans*

VIRUSSE/VIRUSES

OP-VIR.1: Growth and attenuation of horsesickness virus types in cell culture systems. 1979. B.J. Erasmus

OP-VIR.29: Pathogenesis of African horsesickness. 1979. B.J. Erasmus, J.G. Pienaar

ALGEMEEN/GENERAL

BAKTERIEë/BACTERIA

OP-BACT.37: Significance and incidence of the K antigen types of *E. coli* in animals in South Africa. 1979. M.M. Henton

OP-BACT.57: Invloed van verskillende faktore op die sporulasie van *Bacillus anthracis*. 1974. J.F. van der Berg

OP-BACT.61: Strain specificity in staphylococcal immunity. 1977. C.M. Cameron

OP-DMR.51: Methods for releasing bacteria and protozoa from solid particles of ingesta. 1976. R.I. Mackie, F.M.C. Gilchrist, P.A. Henning

OP-DMR.52: Method for counting lactic acid-utilizing bacteria. 1976. R.I. Mackie

OP-DMR.53: Method for counting proteolytic bacteria. 1976. R.I. Mackie, J.J. Theron

OP-DMR.54: Methods for counting amylolytic and glucolytic bacteria. 1976. F.M.C. Gilchrist, R.I. Mackie

OP-DMR.55: Production and utilization of lactic acid by pure cultures of rumen bacteria. 1976. R.I. Mackie

OP-DMR.65: Influence of starch and its degradation products on the digestion of cellulose and xyland by various species of rumen bacteria. 1979. N.O. van Gylswyk, A.E. van der Walt

OP-DMR.67: Effects of (Na⁺) and its interrelationships with (K⁺) on the growth rate of key functional rumen bacteria. 1980. P.G. Bahrs

BOSLUISE/TICKS

OP-ENT.19: Systematics of the genus *Rhipicephalus*. 1978. J.B. Walker

OP-HYG.27: Identifikasie van die spesiesoorsprong van vleis deur middel van poliakrimalied-gelektroforese. 1979. H.N. van der Made, W.L. Barnard

HISTOLOGIE/HISTOLOGY

OP-PATH.54: Histological study of the intestine of *Sus scrofa domestica*. 1980. M.S. Myer

INWENDIGE PARASIEË/INTERNAL PARASITES

OP-HELM.34: Herwinning van volwasse en onvolwasse rondewurms en eiers uit dermingesta en/of mis. 1976. J.A. van Wyk

OP-HELM.36: Diagnostiese ondersoeke na wurmsoorste. 1978. J.A. van Wyk, A. Verster, I. Carmichael, R. Alves

OP-HELM.37: Stimulation of immunity to the larval stage of *Taenia multiceps*. 1979. A. Verster, R.C. Tustin

- OP-HELM.38: Influence of temperature on the development of the larval stages of *Fasciola hepatica* and *Fasciola gigantica* - comparative studies. 1979. R.Alves
- OP-HELM.39: Development of *Fasciola hepatica* and *Fasciola gigantica* in different definitive hosts - comparative studies. 1978. R. Alves

PROTOZOë/PROTOZOA

- OP-DMR.58: Ecological study of rumen protozoa. 1977. A.A. Evans

VIRUSSE/VIRUSES

- OP-PATH.43: Encephalitozoonosis in the sub-human primate caused by an Encephalitozoon isolated from the dog. 1977. A.F. van Dellen, Wilna F. Botha, C. Steward
- OP-VIR.31: Characterization of certain Diplorna virus. 1979. B.J. Erasmus
- OP-VIR.47: Immunogenicity of RVF virus cultivated in BHK suspended cell cultures. 1977. A. Pini, W. Ashford, P.J. van Rooyen, J. Esterhuizen

VOEDING/NUTRITION

- OP-DMR.56: Factors affecting the microbial population of the rumen and the intake and digestion of roughage when increasing amounts of maize are added to a poor roughage diet. 1976. F.M.C. Gilchrist, R.I. Mackie, N.C. van Gylswyk, P.A. Henning, H.M. Schwartz, Y. van der Linden
- OP-HYG.26: Bepaling van die *in vitro*-doeltreffendheid van propionsuur vir die beveiliging van hoendermis vir aanwending as veevoer. 1979. H.N. van der Made, J.J. van Staden
- OP-NUT.11: Spoorelementevaluasie deur middel van leweranalises. 1976. J. de V. du Toit

Entstowwe/Vaccines

PLUIMVEE/POULTRY

- OP-BACT.60: Vergelyking van lewendige en geïnaktiveerde *Salmonella gallinarum*-entstowwe. 1977. C.M. Cameron, S.B. Buys

SKAPE/SHEEP

- OP-VIR.43: Preparation of an inactivated bluetongue virus vaccine. 1974. B.J. Erasmus, W.A. Ashford

VARKE/PIGS

- OP-VIR.53: Development of an inactivated vaccine against porcine parvovirus for use in sows and gilts. 1979. G.R. Thomson, B.T. Spencer, M.D. Gainaru

WEIDINGBENUTTING/PASTURE UTILISATION

Natuurlike Weiding/Natural Pastures

VELD

BENUTTING/UTILISATION

- T-Ng.57: Optimumbenutting van suurgasveld in die Suidoostelike Transvaal waar ploegbare grond vir voerproduksie beskikbaar is:
- 57/1: - Die ekonomie van kruipvoeding en vroegspeen van lammers. 1972. C.J. Dreyer, H.S. Steynberg, J.H. van der Walt, N.F.G. Rethman
 - 57/2: - Supplementêre voeding van dragtige ooie met die oog op verhoogde produktiwiteit. 1972. D. Els, C.J. Dreyer
 - 57/5: - Development of a viable stock-farming system for semi-extensive sourveld. 1971. N.F.G. Rethman, D.W. Eden, C.J. Dreyer, J.C. Smit
 - 57/7: - Mineraalstatus van skape op die Oostelike Hoëveld van Transvaal. 1973. H. Steynberg, C.J. Dreyer, P.A. Boyazoglu, J.A.C. Fourie
 - 57/8: - Optimum utilisation of *Eragrostis curvula* by grazing animals. 1974. N.F.G. Rethman, B.H. Beukes, D.W. Eden, J.H. van der Walt, P.J.K. Morgan

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- H-Ps.60: Seisoensbeweiding van *Themeda-Cymbopogon*-veld:
- 60/1: - Beweiding van die veld gedurende bepaalde jaargetye, alleen en in kombinasie. 1963. G. Coetsee
- H-Ps.229: Weiveldbeheer in die noordelike variant van die *Cymbopogon-Themeda*-veld en in die westelike variant van die Bankenveld:
- 229/1: - Bestuur van klipveld wat met gousiektebossie (*Pachystigma pygmaeum*) besmet is. 1968. G. Coetsee
- K-Gf.1: Veld grazing experiment: Camp No. 6. 1934. P.W. Roux
- K-Gf.2: Veld grazing experiment: Seligman Old Block. 1941. P.W. Roux
- K-Gf.3: Veld grazing experiment: Hill Camp. 1943. P.W. Roux
- N-Ko.7: Veld management studies in East Griqualand:
- N-Th.3: Veld burning and/or mowing without grazing. 1944. B.D. Mappledoram
- OK-Do.50: Studies on various grazing systems for the Döhne Sourveld:
- 50/1: - Continuous grazing by cattle and prolonged grazing with periodic sparing. 1939. A.J. Aucamp
 - 50/2: - Rotational resting from January to January. 1961. A.J. Aucamp
 - 50/6: - Response of *Elionurus argenteus* to different defoliation treatments. 1971. L.O. Nel
 - 50/8: - Stocking density and species and area selection. 1972. T. Daines, L.O. Nel

- OK-Do.83: Optimale ontwikkeling en benutting van die droë gras/bosgemeenskappe van die Oos-Kaapstreek:
- 83/1: - Ontwikkeling van 'n praktiese, aanvaarbare boerderystelsel te Adelaide. 1976. A.J. Aucamp
- SW-Kh.2: Produksie- en veldbestuurstelsels in Suidwes-Afrika:
- 2/1: - Benutting van Ariede Kalahariveld met ses produksiestelsels. 1976. J.P. van Niekerk, G.J. Agenbach
- 2/2: - Benutting van die Dwergruiksavannaveld met vier produksiestelsels. 1976. J.P. van Niekerk, D. Kotze
- T-Ng.42: Defoliation by mechanical means of the North-Eastern Sandy Highveld:
- 42/2: - Influence on the sward of winter defoliation. 1968. N.F.G. Rethman, B.H. Beukes
- T-Ng.55: Optimum utilization of 'extensive' sourveld in the South-Eastern Transvaal, eliminating untimely burning:
- 55/1: - Development of a viable stock-farming system. 1969. N.F.G. Rethman, D.W. Eden, C.J. Dreyer, J.C. Smit
- T-Pr.74: Brand- en snyproef op veld. 1950. A.J. Pienaar
- T-Tw.22: Ononderbroke beweiding en vasgestelde seisoenswisselingstelsels: Towoombanavorsingstasie. 1935. B.H. Robinson, C.J. Breytenbach
- W-Nt.1: Veldbeweidingsstudies by die Nortierproefplaas:
- 1/5: - Invloed van afsonderlike en gesamentlike beweiding deur skape en beeste op die bedekking en samestelling van die Kusfynbos van die Strandveld. 1973. F.G.J. van der Westhuizen

BYVOEDING/SUPPLEMENTATION

- K-Gf.129: Voedingswaarde van Karooweidings:
- 129/4: - Invloed van energie- en proteïenaanvulling met en sonder 'n fosfaataanvulling op produksie en reproduksie van Merinoskape op vier soorte Karooveld. 1979. F.C. Hayward, G.A. Jacobs

EKOLOGIE/ECOLOGY

- K-Gf.126: Plantekologie (weiveldbeheer):
- 126/1: - Fotografiese opnametegniese vir die evaluering en meet van veranderinge in Karooplantegroei. 1974. P.W. Roux
- OK-Do.69: Ekologiese studies van die Valleibosveld in die Oos-Kaapstreek:
- *69/1(K): - Ondersoek na die invloed van ontblaring op *Portulacaria afra*. 1971. A.J. Aucamp
- *69/2: - Ondersoek na die reserwestatus van *Portulacaria afra*. 1972. A.J. Aucamp
- *69/3: - Ondersoek na die invloed van rus op die kwaliteit en produksie van die Valleibosveld. 1973. A.J. Aucamp
- *69/4: - Ondersoek na die weidingspotensiaal van die Valleibosveld. 1973. A.J. Aucamp
- *69/5: - Ondersoek na die produksie van *Portulacaria afra*. 1972. A.J. Aucamp
- OK-Do.79: Botaniese opname van die Bo-Oranjerivier-opvanggebied:
- *79/6: - Subopvanggebiede Stormbergspuit, Bamboes, Wonderboom en Bo-Stormberg. 1974. J.J. van Pletzen

- T-Mr.9: Invloed van beweiding deur beeste, skape en bokke in Noord-Transvaal:
9/2: - Bokke en/of beeste op mopanieveld. 1969. C.H. Donaldson

GROEISTUDIES/GROWTH STUDIES

- T-Ng.44: Growth and development of perennial veld grasses in the Eastern Transvaal
Highveld:
44/2: - *Andropogon amplexans* and *Eulalia villosa*. 1973. N.F.G. Rethman, G.D.
Kotzé

HERWINNINGSTUDIES/RECLAMATION STUDIES

- SW-Om.4: Ontwikkeling van die verboste gebiede in Suidwes-Afrika:
4/2(K): - Uitwerking van lugbespuiting met Tordon 225 op die veld en diereproduksie
asook die ekonomiese implikasies daarvan.1975. J.P. van Niekerk, F.V.
Bester
T-Mr.12: Veldherwinning in die Noord- en Noordwes-Transvaalse bosveld:
12/1: - Intensifikasie van die weidingsvermoë van die soetbosveld. 1972. C.H.
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OUTEKOLOGIE/AUTECOLOGY

- W-Nt.1: Veldbewaringstudies by die Nortierproefplaas:
1/6: - Invloed van seisoenale ontblaring op die reserwes en droëmateriaalproduksie
van Karoobossies en gras. 1977. F.G.J. van der Westhuizen

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- K-Gf.124: Drakragnorme:
124/2: - Bepaling van biomassa en produksie van elf veldtipes in die Karoostreek.
1978. O.J.H. Bosch, P. Botha
OK-Do.83: Optimale ontwikkeling en benutting van die droë gras/bosgemeenskappe van
die Oos-Kaapstreek:
83/3(K): - Invloed van *Acacia karroo* op voerproduksie. 1977. A.J. Aucamp

VOEDINGSWAARDE/NUTRITIONAL VALUE

- H-Ps.173: Biochemiese ondersoek na die voedingswaarde van veldgrasse:
173/4: - Koolhidraatfraksies en lignieninhoud van *Themeda triandra*. 1968. J.W.
Cilliers
173/5: - Voedingswaarde van bemeste veld. 1971. J.W. Cilliers
O-Gl.123: Doeltreffende benutting van natuurlike veld in die OVS-streek:
123/5: - Ondersoek na die beenfosforstatus van bees en skaap op veldweiding van
Armoedsvlakte. 1979. B. Ferreira
123/6: - Ondersoek na die fosforstatus van beeste op veldweiding van die sentrale
OVS. 1978. B. Ferreira
123/8: - Waterinname van droë skape. 1980. A.S. Faure
O-Gl.125: Evaluasie van die voedingswaarde van ruvoere en weidings:
125/2: - Voluntary intake and digestibility of different forages by cattle and sheep.
1964. J.A. Swart, E.A.N. Engels, B. Ferreira

- 125/10: - Ondersoek na 'n praktiese *in vitro*-metode om die voedingswaarde van ruvoere vir herkouers te voorspel. 1967. E.A.N. Engels, A. van Schalkwyk, B. Ferreira, A. Malan
- 125/22: - Evaluering van die voedingswaarde van die natuurlike weiding van die Oranjerivier gebroke veld en Kalahari-duineveld. 1977. A.S. Faure, D.A. Boshoff, E.A.N. Engels, F.J.L. Burger
- 125/25: - Aanwending van geproduseerde ruvoere vir melkproduksie in die sentrale Oranje-Vrystaat. 1978. E.A.N. Engels, C.L. Hartman

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- N-Ko.5: Production systems for beef cattle in East Griqualand:
- 5/5: - Evaluation of veld potential in terms of production per animal and per hectare. 1975. A.D. Lyle, G.M. Brockett
- O-Gl.72: Ontblaring van droë *Cymbopogon-Themeda*-veld:
- 72/5: - Vergelykende ontblaringstudies binne in beheerde selektiewe beweiding met wisselende aantal kampe. 1976. L.F. Vorster, A.F.J. Visagie, P.C.N. Goosen
- O-Gl.141: Vastelling van norme om die drakrag van die natuurlike veld van die Oranje-Vrystaat te bepaal:
- 141/2: - Produksiepotensiaal van die natuurlike veld van die Vrystaatgedeelte van die Oranje-Vrystaatstreek. 1973. L.F. Vorster
- 141/3: - Evaluasie van die produksiepotensiaal van Kalkveld in die noordoostelike gebied van die Ghaapse plato. 1977. J.H. Fourie
- O-Kf.17: Vaalbosstudies op die Ghaapse plato:
- *17/1: - Waarde van vaalbos as weiding vir skape. 1964. W.R.E. Nursey
- OK-Do.83: Optimale ontwikkeling en benutting van die droë gras/bosgemeenskappe van die Oos-Kaapstreek:
- 83/2(K): - Evaluasie van die produksiepotensiaal van 'n *Acacia*/grasgemeenskap. 1977. A.J. Aucamp
- T-Ng.53: Evaluasie van natuurlike suurveld in die Suidoostelike Transvaal:
- 53/1: - Voedingswaarde van natuurlike veld bepaal met gefistuleerde diere in 'n beheerde selektiewe weidingstelsel. 1972. D.W. Eden, E.B. Spreeth, S.C.N. West
- T-Ng.56: Seleksie deur dier en evaluasie van die Suidoostelike Transvaal Suurveldtipes:
- 56/2: - Veldobservasie. 1971. G.D. Kotzé, N.F.G. Rethman
- 56/3: - Ondersoek van oesophageale fistulamonsters. 1971. B.H. Beukes, N.F.G. Rethman, G.D. Kotzé

Veldverbetering/Veld Improvement

BEMESTING/FERTILIZERS

- N-Ce.108: Pasture production studies in the Umgeni catchment:
- 108/7: - Reaction of grass/legume pasture to levels of phosphorus and lime. 1977. P.E. Bartholomew, C.I. McDonald
- 108/8: - Reaction of white clover to levels of phosphorus and lime. 1977. P.E. Bartholomew
- N-Ce.132: Evaluation of *Cynodon dactylon* cv. Coastcross II in the Eastern Grassveld:

- 132/3: - Effect of various levels of N, P and K on grass productivity at Cedara. 1974. P.E. Bartholomew, J.W. Cross, C.I. MacDonald
- N-Ec.20: Mineral nutrition of pastures on the partly leached soils of Natal:
- 20/1: - N, P, K and lime for *Eragrostis curvula* on a red soil of the D1 association, De Hoek. 1969. P.E. Bartholomew
- O-Gl.147: Evaluasie van *Antheophora pubescens*:
- 147/4: - NPK-bemestingsproef. 1976. L.F. Vorster, A.H.G. Kruger
- SW-Hp.4: Evaluasie van weidingsgewasse in die Bosveldgebiede van SWA:
- 4/1: - Bepaling van die bemestingsbehoefte en produksiepotensiaal van *Cenchrus ciliaris* (droëland) op die verskillende grondsoorte in SWA. 1977. J.G.S. Steenkamp, A.J. Steyn, G. Thomas, J. Barnard
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- SW-Wk.5: Evaluasie van *Antheophora pubescens*:
- 5/5: - NPK-bemestingsproef. 1977. J.G.S. Steenkamp
- T-Ng.25: *Eragrostis curvula* (weeping lovegrass) in the Drakensberg grazing area:
- 25/8: - Type, level and distribution of phosphatic fertilizer. 1969. N.F.G. Rethman, B.H. Beukes
- 25/9: - Distribution of phosphatic fertilizer during the season. 1971. N.F.G. Rethman, B.H. Beukes
- 25/10: - Influence of burning, level of nitrogen fertilization and height of stubble on seed production. 1973. N.F.G. Rethman, B.H. Beukes
- T-Ng.60: Evaluation of grasses and legumes in the South-Eastern Transvaal:
- 60/10: - Influence of level and distribution of fertilizer on kikuyu. 1975. N.F.G. Rethman, C.C. de Witt
- T-Pr.40: *Eragrostis curvula* (Ermelotipe): Bemestingsproef met stikstof en superfosfaat. 1950. A.J. Pienaar
- T-Pr.41: *Eragrostis curvula* (Pretoriatipe): Bemestingsproef met ammoniumsulfaat en superfosfaat. 1951. A.J. Pienaar
- T-Pr.73: Bemesting van somergras- en peulplantmengsels met stikstof en fosfaat. 1953. A.J. Pienaar
- T-Pr.75: Proef met verskillende stikstofhoudende kunsmisstowwe op veld. 1953. A.J. Pienaar
- T-Rp.31: Evaluation of *Cenchrus ciliaris*:
- *31/2: - Effect of row espacement, seeding rate and nitrogen fertilization. 1973. C.H. Donaldson, B.J.M. Nel
- *31/5: - Nitrogenous fertilizer applied according to soil moisture and rainfall. 1972. C.H. Donaldson, B.H. Robinson, G.T. Rootman, C.J. Breytenbach
- T-Tw.1: Bemesting van *Panicum coloratum* en *Cenchrus ciliaris* met stikstof en fosfaat. 1955. J.J. van der Merwe
- T-Tw.2: Veldbemestingsproef met stikstof en fosfaat. 1949. B.H. Robinson

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- N-Ec.12: Utilization of established pastures by grazing:

- 12/5: - Characterisation of *Eragrostis curvula* in terms of the grazing animal. 1976. G.M. Brockett, A.D. Lyle, N.N. Gray
- 12/6: - Foggage value of pastures in the Natal Midlands. 1977. J. Arnott, A. Starke
- 12/7: - *Dactylis glomerata* (Karkloof) with and without legume at two stocking rates. 1980. P.J. Edwards
- 12/8: - Foggage value of pastures in bioclimate 4f

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- O-Gl.147: Evaluasie van *Antheophora pubescens*:
- 147/5: - Reaksie van vyf ekotipes op beweiding. 1977. A.H.G. Kruger, L.F. Vorster
- OK-Do.87: Herbage production trial for pasture species selection:
- 87/1: - *Dactylis glomerata* in the Eastern Cape Region. 1977. J.H. P'ons
- SW-Wk.5: Evaluasie van *Antheophora pubescens*:
- 5/1: - Ekotipe-evaluasie by twee bemestingspeile op rooileemgrond van die Damarageesteentes. 1977. J.G.S. Steenkamp
- 5/2: - Ekotipe-evaluasie by twee bemestingspeile op 'n swart turfgrond afkomstig van dolomiet. 1977. J.G.S. Steenkamp
- 5/3: - Ekotipe-evaluasie by twee bemestingspeile op 'n Kalahari-sandgrond. 1977. J.G.S. Steenkamp
- 5/4: - Reaksie op verskillende frekwensies en intensiteite van sny. 1977. J.G.S. Steenkamp

HOOI/HAY

- T-Ng.25: *Eragrostis curvula* (weeping lovegrass) in the Drakensberg grazing area:
- 25/7: - Height and stage of cutting. 1969. N.F.G. Rethman
- 25/11: - Comparison of hay feeding practices in evaluating the role of feedback on hay pastures. 1973. N.F.G. Rethman, B.H. Beukes
- 25/12: - Invloed van peil van bemesting en stadium van oes op die opbrengs en voedingswaarde van hooi. 1976. N.F.G. Rethman, C.J. Dreyer, B.H. Beukes, L. Bouwer

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- H-Ps.234: Permanent cultivated pastures under dryland conditions in the western portion of the Highveld Region:
- 234/1: - Grass nursery. 1940. R.H. Drewes
- N-Th.16: Evaluation of grasses and legumes in the Natal region:
- 16/9: - Preliminary evaluation of pasture plants at the Plant Materials Centre in the Tall Grassveld. 1968. B.D. Mappedoram
- O-Gl.143: Evaluasie van weidingsplante in die Oranje-Vrystaatstreek:
- 143/1: - Voorlopige waardebeepaling van weidingsplante in 'n kwekery te Glen. 1973. J. du Toit, A.R. Blair
- OK-Do.63: Introduction and evaluation of promising pasture species in the Eastern Cape:
- 63/6: - Pasture nursery, Dohne. 1976. J.H. P'ons
- 63/7: - Pasture nursery, Bathurst. 1976. R.A. Ingpen
- W-Oq.7: Kwekerystudies. 1955. J.H. Blomerus

RADIKALE VELDVERBETERING/RADICAL VELD IMPROVEMENT

- H-B1.63: Radikale veldverbetering in die oostelike Hoëveldstreek:
- 63/4: - Melkproduksie op bemeste veld. 1972. J.A. Kruger
 - 63/5: - Waarde van droëlandgras/peulgewasweidings vir melkproduksie. 1978. J.A. Kruger, K.G. Cronje
 - 63/6: - Waarde van droëlandgras/peulgewasweidings vir skape gedurende dragtigheid. 1978. J.A. Kruger, A.J. van Heerden
- H-Ps.228: Radical veld improvement in the northern variation of the *Cymbopogon-Themeda* veld and in the western variation of the Bankenveld:
- 228/1: - Evaluation of introduced plant species. 1967. R.H. Drewes
 - 228/2: - Veld fertilisation in the Bankenveld. 1968. G. Coetsee
 - 228/7: - Invloed van verskillende stikstof- en fosfaatbemestingspeile op die plantmateriaalopbrengs van *Cymbopogon-Themeda*-veld. 1970. G. Coetsee
 - 228/8: - Effect of height of selective defoliation and fertilisation on *Cymbopogon-Themeda* veld. 1970. R.H. Drewes
 - 228/9: - Invloed van stikstofbronne op *Cymbopogon-Themeda*-veld. 1970. G. Coetsee
 - 228/10: - Invloed van verskillende fosfaatbronne op *Cymbopogon-Themeda*-veld. 1970. G. Coetsee
 - 228/11: - Veldproduktiwiteitsevaluering met diermassaveranderings oor verskillende weitydperke. 1970. G. Coetsee
 - 228/12: - Invloed van benuttingspraktyke op stikstofbemeste *Cymbopogon-Themeda* veld. 1970. R.H. Drewes
 - 228/16: - Summer production systems for *Cymbopogon-Themeda* veld. 1973. R.H. Drewes
- H-Ps.253: Benutting van radikaal verbeterde veld:
- 253/1: - Somerbenutting van veld en RVV deur Simmentalerkoeie met kalwers. 1976. J.W. Cilliers
- N-Dd.5: Radical veld improvement in the Sandy Sourveld of Natal:
- 5/3: - Fertilisation and reinforcement of old lands under grazing - Dundee. 1972. P.E. Bartholomew, E.P. Theron, S.F. Lesch, H.J. Meaker
- N-Ec.17: Radical veld improvement in the Highland Sourveld of Natal:
- 17/14: - Preliminary comparison of different forms of radical veld improvement. 1971. P.J. Edwards, B.D. Mappledoram, S.F. Lesch
 - 17/15: - Preliminary comparison of different forms of radical veld improvement involving the use of beef cows and calves. 1973. P.J. Edwards, S.F. Lesch, B.D. Mappledoram
 - 17/16: - Effect of different classes of pasture on the productivity of cow herds. 1976. P.J. Edwards, B.D. Mappledoram, S.F. Lesch
- T-Ng.46: Radikale veldverbetering in die Suidoostelike Transvaal:
- 46/1(K): - Bemesting van Noordoostelike Sanderige Hoëveld. 1970. N.F.G. Rethman
 - 46/2(K): - Fertilisation of North-Eastern Mountain Sourveld. 1969. N.F.G. Rethman, B.H. Beukes
 - 46/4: - Introduction of rhizomatous grasses into veld. 1970. B.H. Beukes, N.F.G. Rethman

- 46/5: - Establishment of *Pennisetum clandestinum* in non-arable natural veld. 1972. N.F.G. Rethman, G.D. Kotzé
- 46/6: - Influence of fertilisation and paraquat on the feeding value of veld in the winter. 1973. N.F.G. Rethman, G.D. Kotzé
- 46/7: - Vestiging van meerjarige peulplante in natuurlike veld in die Suidoostelike Transvaal. 1974. N.F.G. Rethman, C.C. de Witt
- 46/8: - Comparison of *Vigna vexillata* reinforced veld with natural veld for autumn grazing by sheep. 1973. G.D. Kotzé, N.F.G. Rethman, W.R.E. Nursey

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- N-Ce.30: Improvement of *Paspalum dilatatum*. 1959. J.M.L.C. Rhind
- N-Ce.33: Development of improved strains of *Dactylis glomerata*. 1959. J.M.L.C. Rhind
- N-Ce.34: Development of improved strains of *Lolium multiflorum*. 1959. J.M.L.C. Rhind, J.D.H. Reusch, D.C.W. Goodenough
- N-Ce.102: Breeding of *Eragrostis curvula* in the Natal Region:
 - 102/1: - Selection and breeding of superior cultivars. 1966. J.M.L.C. Rhind
- N-Ce.147: Breeding of temperate pasture grass cultivars in the Natal Region:
 - 147/1: - *Festuca arundinacea*. 1978. J.M.L.C. Rhind, D.C.W. Goodenough, J.P. Marais
 - 147/2: - *Lolium perenne*. 1978. J.M.L.C. Rhind, D.C.W. Goodenough

VELDVERVANGING/VELD REPLACEMENT

- N-Ce.111: Veld replacement studies:
 - *111/19(K): - Effect on animal production of the radical improvement of veld in East Griqualand by fertilizing and oversowing. 1972. G.M. Brockett, N.N. Gray, J.K. Arnott, S.F. Lesch
 - *111/21(K): - Effect on animal production of radical improvement of the Highland Sourveld (Balgowan) by fertilizing and oversowing. 1973. J.K. Arnott,
 - 111/24: - Evaluation of top kikuyu selections for cold tolerance resistance to "yellows" disease and seedling vigour. 1977. J. Arnott
 - 111/25: - Strip replacement of Ngongoni with legumes. 1979. P.J. Edwards, C.I. MacDonald

VERSTERKING/REINFORCEMENT

- W-VI.16: Weiveldverbetering in die Klein Karoo:
 - 16/9: - Veldverbetering in die karooagtige gebroke veld deur die insaai van nuttige plantsoorte. 1976. L.E. Nolte

VOORTPLANTING/REPRODUCTION

- N-Ce.119: Survey of the mode of reproduction in certain grasses and legumes in South Africa:
 - 119/3: - *Chloris gayana*. 1970. J.M.L.C. Rhind
 - *119/4: - *Digitaria smutsii*. 1970. J.M.L.C. Rhind
 - *119/5: - *Acroceras macrum*. 1970. J.M.L.C. Rhind, J.D.H. Reusch, D.C.W. Goodenough

WAARDEBEPALING/EVALUATION

- (A)VS-Pr.106: Evaluation of pastures for ruminant production:
 106/1: - Evaluation of kikuyu pasture for ruminant production. 1977. R.A. Clark
- H-BI.64: Evaluasie van grasse en peulgewasse in die Oostelike Hoëveld:
 64/1: - Vergelyking van die reaksies van tien peulgewasse op sny- en weibehandlings op 'n Avalon-grondvorm (Soetmelkserie). 1974. J.A. Kruger
 64/2: - Vergelyking van die reaksies van tien peulgewasse op sny- en weibehandlings op 'n Dundee-grondvorm. 1974. J.A. Kruger
 64/3: - Vergelyking van die reaksies van tien peulgewasse op sny- en weibehandlings op 'n Oakleaf-grondvorm (Leeufonteinserie). 1974. J.A. Kruger
 64/4: - Vergelyking van die reaksies van agt grassoorte op sny- en weibehandlings op 'n Avalon-grondvorm (Soetmelkserie). 1974. J.A. Kruger
 64/5: - Vergelyking van die reaksie van agt grassoorte op sny- en weibehandlings op 'n Dundee-grondvorm. 1974. J.A. Kruger
 64/6: - Vergelyking van die reaksies van agt grassoorte op sny- en weibehandlings op 'n Oakleaf-grondvorm (Leeufonteinserie). 1974. J.A. Kruger
- H-Ps.254: Vestiging van dekgewasse en stabilisering van gronde vir waterafloopbeheer:
 254/1: - Evaluasie van 'n aantal grasse vir uiteindelijke aanplanting op waterbane op 'n Hutton-grondvorm. 1976. C.S. Danhauser
- N-Ce.132: Evaluation of *Cynodon dactylon* cv. Coastcross II in the Eastern Grassveld:
 *132/2(K): - Performance of a beef cow herd when grazed continuously on Coastcross II pastures at Umlaas Road. 1974. J.K. Arnott
 132/4: - Performance of a beef yearling herd when grazed continuously on Coastcross II pastures at Cedara. 1974. J.K. Arnott
- N-Ce.134: Evaluation of pasture plants in the Natal Region:
 134/1: - Evaluation of *Digitaria* ecotypes as pasture grasses. 1973. A. Smith
 134/4: - Evaluation of *Lolium multiflorum* cultivars at various planting dates. 1977. D.C.W. Goodenough, C.I. MacDonald
- N-Ce.142: Herbage production trials for pasture species selection:
 142/1: - *Dactylis glomerata* in Natal Region. 1977. B.D. Mappedoram
- N-Ec.10: Evaluation of plant species and cultivars for pastures:
 10/4: - *Eragrostis curvula* cultivar experiments on the Clovelly soil type in the Highland Sourveld of Natal. 1964. E.P. Mappedoram, J.H. Cunningham
- N-Th.16: Evaluation of grasses and legumes in the Natal Region:
 16/1: - *Dactylis glomerata* cultivar trial in the Highland Sourveld. 1969. B.D. Mappedoram
 16/5 & 16/6: - *Trifolium repens* cultivar trial located in the Highland Sourveld of Natal. 1972. B.D. Mappedoram
 16/10: - Phase 2 pasture evaluation trial on a Shortlands soil series in the Tall Grassveld. 1968. P.J. Edwards. C. Apsey
 16/16: - Preliminary evaluation of pasture plants in the Highland Sourveld. 1970. B.D. Mappedoram

- 16/17: - Screening of *Eragrostis curvula* and *Acroceras macrum* selections in the Highland Sourveld. 1972. B.D. Mappledoram
- 16/23: - Beef production on stargrass at three stocking rates. 1972. P.J. Edwards, C. Apsey
- 16/26: - Comparison of various tropical grasses and legumes when grown at Kokstad on a soil typical of the Doveton series. 1973. G.M. Brockett, N.N. Gray
- 16/27: - Comparison of various tropical grasses and legumes when grown at Kokstad on a soil typical of the Arrochar series. 1973. G.M. Brockett, N.N. Gray
- 16/32: - Classification, processing and assessment of available data. 1976. G.W. Cross
- 16/33: - Companion legumes for kikuyu (*Pennisetum clandestinum*) under different management systems. 1976. N.G.E. Hackland, G.W. Cross, C.I. MacDonald
- 16/34: - Companion legumes for a stargrass pasture under different management systems. 1975. N.G.E. Hackland, G.W. Cross, C.I. Macdonald
- 16/35: - Companion legumes for Coastcross II (*Cynodon dactylon* hybrid) pasture under different management systems. 1976. N.G.E. Hackland, G.W. Cross, C.I. MacDonald
- 16/36: - Production and persistence of legumes in a kikuyu pasture. 1976. N.G.E. Hackland, G.W. Cross, C.I. MacDonald
- 16/37: - Phase 2 stargrass evaluation trial on an "Estcourt" soil in the Tall Grassveld. 1978. B.D. Mappledoram, J.M. Cunningham
- 16/38: - Phase 2 stargrass evaluation trial on an "Avalon" soil in the Tall Grassveld. 1978. B.D. Mappledoram, J.M. Cunningham
- 16/39: - Phase 2 stargrass evaluation trial on an "Uitvlugt" soil in the Tall Grassveld. 1978. B.D. Mappledoram, J.M. Cunningham
- 16/40: - *Trifolium pratense* cultivar trial located in the Highveld Sourveld of Natal. (First group of cultivars). 1978. B. Mappledoram
- 16/41: - *Trifolium pratense* cultivar trial located in the Highland Sourveld of Natal. (Second group of cultivars). 1978. B. Mappledoram
- 16/42: - Phase two evaluation of selected grass/legume combinations in the drier phase of the Highland Sourveld of Natal. 1978. G.M. Brockett
- O-G1.143: Evaluering van weidingsplante in die Oranje-Vrystaatstreek:
- 143/2: - Voorlopige waardebeepaling van weidingsplante in 'n kwekery te Vaalharts-Landbounavorsingstasie. 1974. A.H.G. Kruger, J. du Toit
- 143/6: - Evaluasie van *Cenchrus ciliaris*-weiding vir beesvleisproduksie in die Middel-Vrystaat. 1978. P.F. du Toit, P.Human, R. Blair
- O-G1.147: Evaluasie van *Antheophora pubescens*:
- 147/1: - Ekotipe-evaluasie by twee bemestingspeile op 'n grond van die Manganoserie. 1976. A.H.G. Kruger
- 147/2: - Ekotipe-evaluasie by twee bemestingspeile op 'n grond van die Annadaleserie te Vryburg. 1976. L.F. Vorster, A.H.G. Kruger
- 147/3: - Ekotipe-evaluasie by twee bemestingspeile op 'n grond van die Sunburyserie te Vergeleë. 1976. L.F. Vorster, A.H.G. Kruger
- OK-Do.63: Introduction and evaluation of promising pasture species in the Eastern Cape:
- *63/5: - Evaluation of livestock production on greenleaf desmodium/grass pastures at Fairview, Bathurst. 1973. F.O.C.W. Karberg

- 63/8: - Screening of species for veld reinforcement in the Dohne Sourveld. 1975. J.H. P'ons
- 63/9: - Evaluation of stargrass for beef production at Woodbury, Komgha district. 1976. J.H. P'ons
- 63/11(K): - Growth pattern of stargrass (*Cynodon aethiopicus*). 1976. J.H. P'ons
- 63/14: - Growth patterns of summer grasses in the Dohne Sourveld. 1979. G.J.G. le Roux
- 63/15: - Growth patterns of temperate grasses in the Dohne Sourveld. 1979. G.J.G. le Roux
- T-Ng.60: Evaluering van grasse en peulplante in die Suidoostelike Transvaal:
- 60/1: - Evaluation of *Eragrostis curvula* for intensive sheep production. 1972. N.F.G. Rethman, B.H. Beukes, H.S. Steynberg
- 60/2: - Evaluering van peulplante in 'n kikoejoe (*Pennisetum clandestinum*)-weiding. 1973. N.F.G. Rethman, C.C. de Witt
- 60/3: - Determination of the growth potential of grasses as cultivated pastures under irrigation. 1973. N.F.G. Rethman, B.H. Beukes
- 60/4: - Vrywillige inname van ureum- en melassebehandelde *Eragrostis curvula*-hooi in verskillende fisiese vorms deur skape en beeste. 1973. D.W. Eden, C.J. Dreyer, W.R.F.J. le Roux
- 60/5: - Evaluering van peulplante in assosiasie met *Eragrostis curvula*. 1973. N.F.G. Rethman, C.C. de Witt
- 60/6: - Evaluation of perennial dryland grass pastures for livestock production systems. 1973. N.F.G. Rethman, C.C. de Witt
- 60/9: - Saadvermeerdering van tropiese en subtropiese voerpeulgewasse. 1975. L.G. van Zyl
- 60/11: - Influence of length of rest prior to the winter on the feeding value of kikuyu. 1974. N.F.G. Rethman, C.C. de Witt
- T-Rp.31: Evaluation of *Cenchrus ciliaris*:
- 31/1: - Performance of *Cenchrus* when used exclusively for summer grazing. 1972. C.H. Donaldson, B.H. Robinson, C.J. Breytenbach
- 31/6: - Studie van verskillende benuttingstye en -intensiteite van *Cenchrus*-weidings met beeste. 1972. C.H. Donaldson, B.J.M. Nel
- 31/7: - Beesvleisproduksie vanaf aangeplante en natuurlike weidings op die Springbokvlakte. 1973. G. Marincowitz, B.H. Robinson, C.J. Breytenbach
- *31/8: - Pilot study of a method for establishing seasonal growth patterns. 1972. C.H. Donaldson, G. Rootman
- *31/9: - Evaluation of *Cenchrus ciliaris* ecotypes in terms of dry matter intake. 1973. C.H. Donaldson, G. Rootman
- 31/10: - Evaluation of irrigated *C. ciliaris* and other tropical pastures for intensive sheep production. 1973. C.H. Donaldson, G. Rootman
- *31/11: - Ondersoek na die produksiewaarde van mediumkwaliteit *Cenchrus ciliaris*-hooi. 1975. J.P. Pienaar, P.J.K. Morgan
- T-Rp.40: Evaluering van grasse en peulgewasse vir die bosveldgebiede van Transvaalstreek:
- 40/1: - Tweede fase produksiebepaling van *Digitaria*-introduksies. 1975. L.G. van Zyl

- 40/2: - Produksiebepaling van *Panicum maximum* Jacq.-introduksies. 1975. L.G. van Zyl
- W-Nt.1: - Veldbeweidingsstudies by Nortierproefplaas:
- 1/7: - Evaluasie van *Chrysanthemoides*-, *Medicago*- en *Atriplex*-spesies as weidingsgewasse vir die Strand- en Sandveld van die Weskus
- W-Sb.96: - Ekologiese studie van Robertson Karoo:
- 96/3: - Evaluering van saadvermeerdering van natuurlike weidingsgewasse te Worcester-veldreserwe. 1977. F.G.J. van der Westhuizen
- W-Tk.3: - Evaluasie van weidingsgewasse en skaapbestuurspraktyke in die Winterreënstreek:
- 3/3: - Drakragstudies met aangeplante weidings. 1972. C.J. Pienaar, J.D. Langenhoven, J.M. van Heerden
- 3/6: - Investigation of the suitability of Mediterranean pasture species to specific environments and to grazing conditions in the Winter Rainfall Region. 1973. J.M. van Heerden, J.D. Langenhoven
- 3/8: - Voedingswaarde van *Medicago truncatula* (cv. Jemalong) vir skape. 1976. T.T. de Villiers
- 3/11: - Bepaling van die drakrag van droëland-graspeulgewasweidings in die Rûensgebied. 1978. J.M. van Heerden, J.D. Langenhoven, J.E. Wicht
- 3/12: - Evaluasie van meerjarige weidingspeulgewasse en -grasse. 1978. J.M. van Heerden, J.D. Langenhoven, J.E. Wicht
- 3/14: - Evaluasie van weidingsgewasse en skaapbestuurspraktyke: Bepaling van die drakrag van 'n gras/peulgewasweiding onder besproeiing. 1979. J.M. van Heerden, J.D. Langenhoven

Aangeplante Weidings/Cultivated Pastures

BEMESTING/FERTILISER

- H-Ps.234: - Permanente aangeplante weiding onder droëlandtoestand in die westelike deel van die Hoëveldstreek:
- 234/5: - Invloed van weidruk en bemesting op *Digitaria smutsii*. 1979. C.S. Dannhauser
- 234/6: - Invloed van weidruk en bemesting op *Digitaria smutsii* as staande hooi in die winter. 1979. C.S. Dannhauser
- N-Dd.6: - Cultivated pastures in the Sandy Sourveld of Natal:
- 6/3: - Phosphate and potash requirements of *Eragrostis curvula* grown on a member of the Leksand soil series. 1971. P.E. Bartholomew, M.P.W. Farina
- W-Tk.6: - Bemestingsaspekte van aangeplante en natuurlike weidings in die Winterreënstreek:
- 6/2: - Bepaling van die fosforverliese van eenjarige Mediterreense peulgewasse in die Winterreënstreek. 1976. J.D. Langenhoven

BESTUUR/MANAGEMENT

- T-Ng.63: - Optimum utilisation of natural climatic and edaphic resources in the South-Eastern Transvaal by the intensive utilisation of cultivated pastures:
- 63/1: - Development of a viable beef/sheep farming system based on cultivated pastures. 1973. N.F.G. Rethman, D.W. Eden, C.J. Dreyer, J.C. Smit

PEULGEWASSE/LEGUMES

- AW-Rd.1: Groeivereistes van belowende weidings- en voerpeulgewasse:
- 1/1: - Bepaling van inentingsvereiste van weidings- en voerpeulgewasse. 1977. V.D. Wassermann
 - 1/2: - Bepaling van daglengte- en temperatuurvereistes vir normale blomvorming van bepaalde weidings- en voerpeulgewasse. 1978. V.D. Wassermann
 - 1/3: - Screening of pasture legumes for soil acidity tolerance. 1977. J. Kamburov
- (A)PS-Pr.58: Diseases of pasture crops in South Africa:
- 58/3: - Opnames van die voorkoms van siektes by aangeplant peulgewasweidings in somerreëgebiede. 1979. L.J. Mills

PRODUKSIE/PRODUCTION

- N-Ce.142: Herbage production trials for pasture species selection:
- 142/2: - *Festuca arundinacea* in the Natal Region. 1979. B. Mappledoram

RHIZOBIA

- N-Ce.117: Rhizobia studies in Natal:
- 117/1: - Selection of *Rhizobium* strains. 1967. P.J. Edwards, B.W. Strydom, C.I. MacDonald, B.D. Mappledoram, N.N. Gray

TELING/BREEDING

- N-Ce.146: Breeding of pasture legumes in Natal Region:
- 146/1: - Trifolium species. 1977. A. Smith
 - 146/2: - Screening of *Trifolium* species for mycorrhizal symbiosis and phosphate uptake. 1978. M. E. Thurtell, M.J. Morris, A. Smith

WAARDEBEPALING/EVALUATION

- AW-Rd.2: Evaluasie van weidings- en voerpeulgewasse op Rietondale:
- 2/1: - Kwekerystudies met weidings- en voerpeulgewasse op Rietondale. 1978. C.J. Uys, C.J. Otto
 - 2/2: - Opbrengsproewe met tropiese en subtropiese weidings- en voerpeulgewasse. 1978. A.J. Kruger
 - 2/3: - Opbrengsproewe met koelweerpeulgewasse. 1978. V.D. Wassermann
- H-Ps.234: Permanente aangeplante weidings onder droëlandtoestande in die westelike deel van die Hoëveldstreek:
- 234/4: - Die relatiewe waarde van *Eragrostis curvula* en *Digitaria smutsii*. 1977. C.S. Dannhauser
- N-Ce.151: Conserved pasture and its utilization:
- 151/1: - *Pennisetum clandestinum*. 1979. J.K. Arnott

Ondersteunende Weidingnavorsing/Supporting Pasture Research**BIOLOGIESE EVALUERING VAN VOERE/BIOLOGICAL EVALUATION OF FODDER**

- (A)VS-Pr.87: Benutting van proteïenbronne in die Republiek van Suid-Afrika:
87/1: - Chemiese en biologiese evaluasie van proteïenbronne. 1973. G.A. Smith
- K-Gf.129: Voedingswaarde van Karooweidings:
129/3: - Vrywillige inname, verteerbaarheid en chemiese samestelling van Karooveld soos deur kleinvee geselekteer. 1973. P.J.L. Zeeman
129/4: - Invloed van energie- en proteïenaanvulling op produksie en reproduksie van Merinoskape op vier soorte Karooveld. 1979. F.C. Hayward, G.A. Jacobs
- K-Gf.145: Biologiese evaluering van aangepaste weidings:
N-Ce.150: Analytical evaluation of feedstuffs in the Natal Region. 1978. J.P. Marais

VOERGEWASSE/FORAGE CROPS**DROOGTEBESTANDHEID/DROUGHT RESISTANCE**

- K-Gf.98: Seleksie en teling van droogtebestande voergewasse vir die Karoostreek:
98/1: - Introduksiestudies. 1964. G.C. de Kock
98/2: - Verbetering van doringlose turksvye. 1962. G.C. de Kock, B.A. Lötter
98/3: - Verbetering van oumansoutbos. 1962. G.C. de Kock, B.A. Lötter
*98/4: - Sitogenetiese ondersoek van die vernaamste turksvycultivars (*Opuntia* spp.). 1966. G.C. de Kock

KUILVOER/SILAGE

- H-Ps.215: Kuilvoerproduksie:
215/1: - Bemestings-, bevolkings- en rywydteproef met *Gramineae*-kuilvoergewasse. 1964. D.J. Crafford

PRODUKSIE/PRODUCTION

- K-Gf.79: Groenvoerproduksie van kleingraancultivars. 1963. G.C. de Kock
N-Ce.139: Systems, specifications and simulations for extension use:
139/5: - Linear programme for forage crop production planning. 1977. R.I. Jones

VOORLIGTING/EXTENSION

- N-Ce.143: Data collation for annual fodder crops in Natal Region:
*143/1: - Maize. 1976. F.R. Hyam
143/2: - Winter cereals. 1977. F.R. Hyam
143/3: - Cruciferous crops. 1977. F.R. Hyam
143/4: - Millets. 1977. F.R. Hyam
143/5: - Legumes. 1977. F.R. Hyam
143/6: - Sorghums. 1977. F.R. Hyam
- O-Gl.142: Produksie- en benuttingsmoontlikhede van voergewasse op droëland in die Oranje-Vrystaatstreek:
142/1: - Invloed van ryspasiëring, plantdigtheid en snystadium op die hooiopbrengs van eenjarige voersorghums. 1974. C. Engelbrecht

- 142/3: - Plantdatum- en cultivarproef met verskeie eenjarige voersorghumbasters.
1974. C. Engelbrecht

WAARDEBEPALING/EVALUATION

- H-B1.68: Produksie en evaluasie van wintergrane as weidingsgewasse in die
 Hoëveldstreek:
- 68/1: - Introduksie en evaluasie van wintergroenvoergewasse in die Oos-Vrystaat.
 1977. H.J. du Preez
- 68/5: - Inname en voedingswaarde van tritcale en raaigras. 1980. A.J. van Heerden
- T-Rp.45: Evaluation of *Pennisetum typhoides* as a fodder crop:
- 45/1: - Babala cultivar trial. 1977. C.H. Donaldson, B.H. Robinson, G.T. Rootman
- 45/2: - Die potensiaal van babala, (*Pennisetum typhoides*), as somergewas. 1977.
 C.H. Donaldson, G.T. Rootman

HULPBRONBENUTTING/RESOURCE UTILISATION

KLASSIFIKASIE EN BEPLANNING/CLASSIFICATION AND PLANNING

Grondkunde/Soil Science

BEMESTING/FERTILIZERS

- (S)WP.229: Grondkundige studies in verband met kern- en steenvrug- en tafeldruifverbouwing in die Winterreëengebied:
- 229/2: - Faktore wat die omsetting en vervlugting van verskillende stikstofvorme in die grond beïnvloed. 1977.M. du Preez
- T-Rp.26: Invloed van aluminiumtoksisiteit en fosfaatvaslegging op die benuttingsmoontlikhede van suurgronde in die Transvaalstreek:
- 26/3: - Effek van fosfaatvaslegging en aluminiumtoksisiteit op mielieproduksie. 1971. W.J. Conradie
- T-Rp.28: Bemestings- en bekalkingsbehoefes van die gronde van die Transvaalstreek:
- 28/1: - Koöperatiewe bemestings- en bekalkingsproewe in samewerking met die voorligtingsdiens. 1970. W.J. Conradie
- 28/3: - Roetine-grondontledingsdiens en bemestingsaanbevelings aan boere in die Transvaalstreek. 1971. W.J. Conradie
- W-Sb.149: Kalibrering van chemiese grondontledingsmetodes vir diagnostiese doeleindes:
- 149/1: - Studie van die korrelasie tussen chemies ekstraheerbare fosfor en fosforopname deur verskeie gewasse. 1974. G.R. Thompson
- W-Tk.6: Bemestingsaspekte van grondvrugbaarheid met behulp van peulgewasse en kleingrane in die Winterreënstreek:
- 6/3: - Studie van grondvrugbaarheid met behulp van peulgewasse en kleingrane in die Winterreënstreek. 1978. J.D. Langenhoven, J.M. van Heerden, J.E. Wicht

BESPROEING/IRRIGATION

- (A)S-Pr.45: Ameliorasie van grond en water vir beter benutting onder besproeiingstoestande in Suid-Afrika:
- 45/2: - Bepaling van die waterkwaliteit van Suid-Afrika se oppervlakwaterbronne met behulp van beskikbare inligting. 1972. H.M. du Plessis
- (A)S-Pr.52: Wiskundige grondmodelle vir die bestudering van hidrosoutvloeielsels:
- 52/1: - Die Vis- en Sondagsrivieropvangs- en besproeiingsgebiede. 1975. P.C. van Rooyen, J.N. de Bruyn, T.E. Dohse, H.M. du Plessis, H.C.H. Hahne, J.L. Hutson
- N-Ce.127: Factors affecting the irrigation potential of Natal soils:
- 127/2: - Examination of techniques currently available for the appraisal of salinity and alkalinity. 1972. A. Cass
- 127/3: - Effect of irrigation water on Makatini soils. 1972. A. Cass

BODEMOPNAMES/SOIL SURVEYS

- (A)S-Pr.4: Bodemopnamedienste vir besproeiingsdoeleindes:

- 4/15: - *Ad hoc* surveys for purposes related to irrigation. 1972. C.N. MacVicar, T.E. Dohse
- (A)S-Pr.6: Classification and mapping of the soils of the Republic of South Africa:
- 6/13: - Soil survey of Villiers (1:50 000 topocadastral sheet Grootvlei 2628DC). 1965. E. Verster, C.N. MacVicar
- 6/23: - *Ad hoc* surveys for purposes other than irrigation. 1973. C.N. MacVicar, J.F. Eloff
- (A)S-Pr.48: Inventorizing the terrain form and soils of South Africa with due consideration of climate:
- 48/1: - Highveld Region. 1972. R.W. Bruce, C.N. MacVicar, J.F. Eloff
- 48/2: - Eastern Cape Region. 1972. J.A.V. Dietrichsen, C.N. MacVicar, J.F. Eloff, A.L. Smith-Baillie
- 48/3: - Orange Free State Region. 1972. J.F. Eloff, C.N. MacVicar
- 48/4: - Natal Region. 1972. R.W. Fitzpatrick, J.F. Eloff, D.P. Turner, C.N. MacVicar
- 48/5: - Transvaal Region. 1972. C.N. MacVicar, J.L. Schoeman, J.F. Eloff, B.C. Geers
- 48/6: - Winter Rainfall Region. 1972. F. Ellis, B.H.A. Schloms, C.N. MacVicar, J.F. Eloff
- 48/7: - Karoo Region. 1973. J.A.V. Dietrichsen, C.N. MacVicar, J.F. Eloff
- (A)S-Pr.49: Storage of resource and land-use data:
- 49/1: - Storage of resource and land-use inventory of the Johannesburg-Pretoria complex. 1973. K.P. Taylor, C.N. MacVicar, B.C. Geers, J.F. Eloff, A.B. Oosthuizen, T.U. Yager
- 49/2: - A natural resources and land-use inventory of the Cape Town-Moorreesburg-Worcester complex. 1975. F. Ellis, B.H.A. Schloms, J.F. Eloff, T.E. Dohse, C.N. MacVicar, R.B. Rudman
- N-Ce.124: Detailed soil surveys in the Natal Region:
- 124/2: - Soil survey of the Tala Valley area of the Umlaas River catchment. 1977. D.M. Scotney, D. Dekker, R. Jeffrey
- 124/3: - Soil survey of the False Bay-Hluhluwe area. 1979. R.A. Jeffrey
- OK-Do.84: Grondondersoeke in die Oos-Kaapstreek:
- 84/1: - Soil surveys of selected areas in the Upper Orange River catchment. 1976. M.O. Hartman
- 84/2: - Erodibility of certain soil series in the Molteno district. 1976. M.O. Hartman

BRAKSTUDIES/SALINITY STUDIES

- (S)WP.212: Vrugteverbouing onder braktoestande:
- 212/3: - Evaluasie van brakbesproeiingswater vir sagtevrugte en tafeldruiwe. 1973. W.J. Pienaar
- SW-Hp.1: Verbetering van brakgronde in die Hardapgebied:
- 1/1: - Gebruik van ses primêrebewerkingsmetodes op brakgrond. 1967. G.S.P. Vink

GRONDEIENSKAPPE/SOIL CHARACTERISTICS

- (A)S-Pr.43: Physical properties of South African soils with special reference to irrigation:
- 43/1: - Structural stability of South African soils. 1972. J.L. Hutson
- 43/2: - Use of soil stabilizers in the production of horticultural crops. 1974. J.L. Hutson
- (A)S-Pr.45: Ameliorasie van grond en water vir beter benutting onder besproeiingstoestande in Suid-Afrika:
- 45/1: - Bepaling van die invloed van uitruilbare katione, waterkwaliteit en elektrolietkonsentrasie op die struktuurstabiliteit van grond op beoogde besproeiingskemas. 1972. H.M. du Plessis
- 45/3: - Bepaling van die verwantskappe tussen grond- en watereienskappe asook struktuurstabiliteit van die grond op geselekteerde grondmonsters van die potensiaalbodemonname. 1972. H.M. du Plessis
- (A)S-Pr.51: Beweging en reaksie van afwaters (insluitend gesuspendeerde vaste stowwe) in gronde:
- 51/1: - Ontwikkeling van veld- en laboratoriummetodes vir die evaluering en voorspelling van afwaterbeweging in'n reeks Suid-Afrikaanse gronde. 1974. J.L. Hutson, H.M. du Plessis, B.J. Joubert
- (A)S-Pr.55: Mineralogical and chemical properties of South African soils:
- 55/5: - Silicon-phosphorus-sesquioxide relationships with the view to amelioration of acid soils. 1979. J.S. Easton
- O-Gl.139: Ondersoek na chemiese en fisiese norme vir verskillende grondseries met die oog op optimale gewasproduksie onder verskillende bewerkingspraktyke:
- 139/3: - Potassium studies on various soils in the Orange Free State. 1971. T. Botha
- 139/4: - Ondersoek na bepaling van fisiese eienskappe wat geskik is om die effek van verdigting op gronde te evalueer. 1976. G.N. Krynaauw
- 139/5: - Invloed van verskillende besproeiingspeile op die graad van grondverdigting. 1976. G.N. Krynaauw
- 139/6: - Bekalkingseffekte op suurgronde. 1978. A. van Schalkwyk, P.J. Snyman
- 139/7: - Modellerings van die bemestingsbehoefte van gewasse in die Vrystaatstreek. 1979. G.N. Krynaauw
- 139/8: - Fosforstudies op gronde van die Vrystaatstreek. 1979. G.N. Krynaauw
- W-Sb.139: Bepaling van die besproeiingswaterbehoefte en die verbetering van waterhuishouding van produserende en nie-produserende gronde in die Winterreënstreek:
- 139/2: - Karakterisering van gronde onder besproeiing in die Winterreënstreek ten opsigte van die fisiese en chemiese eienskappe wat hul grondvoghushouding bepaal. 1975. D.J. Beukes
- 139/5: - Rol wat die fynsandfraksie speel in die verdigting van fynsandgrond in die Winterreënstreek. 1976. J.H. Moolman
- 139/6: - Bestudering van die fisiese en chemiese gedrag van besproeide en potensieel besproeibare gronde in die Poesjenelriviervallei (sytak van die Breërivier). 1978. J. H. Moolman

GRONDONTLEDING/SOIL ANALYSIS

- (A)S-Pr.53: Nasionale koördinering en navorsing in verband met die bemestingsadviesdienste ten behoeve van boere:

- 53/3: - Bepaling van 'n basis waarvolgens die gronde van die Republiek van Suid-Afrika sinvol gegroepeer kan word vir doeleindes van grond-vrugbaarheidsevaluering met grondontledingsmetodes. 1975. A.J. van der Merwe
- 53/4: - Vergelyking van metodes wat gebruik kan word vir die evaluering van toeganklike fosfor in Suid-Afrikaanse gronde. 1975. A.J. van der Merwe
- (S)WP.223: Studies in verband met skeikundige en fisiese analitiese metodes:
- 223/1: - Aanwending van selektiewe ioonelektrodes vir bepaling van voedingstowwe in gronde. 1977. J.J.A. Bester
- W-Sb.132: Systematic study of the properties of selected soil series in the Winter Rainfall Region:
- 132/1: - The macro-element status of soils of the Winter Rainfall Region. 1968. G.R. Thompson

GRONDSUURHEID/SOIL ACIDITY

- H-Ps.264: Grondsuurheidstudies in die Hoëveldstreek:
- 264/1: - Metodes vir bepaling van kalkbehoefte vir dominante grondseries. 1978. P.E. Haumann, J.E. Volschenk
- 264/2: - Invloed van bekalking op grondsuurheidseienskappe met die mielie as indikatorplant. 1979. P.E. Haumann, J.E. Volschenk
- (S)WP.170: Reaksie wat toegediende plantvoedingstowwe in gronde ondergaan:
- 170/9: - Bepaling van die grondreaksievereiste van sagtevrugte, en kalkbehoefte van boordgronde in Wes-Kaapland. 1974. W.A.G. Kotzé

GRONDOG/SOIL MOISTURE

- (A)S-Pr.44: Evapotranspiration and water-use studies by means of weighing lysimeters:
- 44/2: - Evapotranspiration of certain crops at Roo-deplaas as a function of soil, plant and atmospheric conditions. 1976. G.C. Green, J.L. Hutson, A. Streutker
- (A)S-Pr.46: Bepaling van norme vir ontwerp en bestuur van besproeiingstelsels vir gewasproduksie:
- 46/2: - Ondersoek van vloed- en sprinkelbesproeiingstelsels. 1973. A. Streutker
- 46/3: - Meting van grondvogverbruik in verhouding tot oesopbrengs. 1976. A. Streutker
- N-Ce.130: Irrigation requirements of agronomic crops on soils of the Natal Region:
- 130/1: - Moisture characteristics and infiltration rates of irrigable soils occurring in the Natal Region. 1973. R. Mottram
- O-Gl.117: Grondvogtoestande by gewasverbouing:
- 117/3: - Metodes van peile van besproeiing by koring, hawer en lusern. 1967. J. de Kock, H.B. Fick, J.G. van Niekerk
- (S)WP.219: Bepaling van grondvog en -digtheid met behulp van gamma-attenuasie. 1975. J.H.M. Karsten
- W-Sb.139: Bepaling van die besproeiingswaterbehoefte en die verbetering van waterhuishouding van produserende en nie-produserende gronde in die Winterreënstreek:

- 139/3: - Grond-water-plantverhoudings: Grondvoghuishoudingstudies onder verskillende grondvogeregimes en die effek van laasgenoemde op geselekteerde fisiologiese en anatomiese groei-eienskappe van plante. 1974. D.J. Beukes

KLASSIFIKASIE/CLASSIFICATION

- (S)WP.229: Systematic study of the properties of selected soil series in the Winter Rainfall Region:
- 229/4: - Classification and mapping of soils on experiment farms of the Fruit and Fruit Technology Research Institute. 1971. J. Wooldridge

MIKROBIOLOGIE/MICROBIOLOGY

- (A)I-Pr.80: Biologie van die grond (dierkundige aspekte):
- 80/3: - Opname van die Suid-Afrikaanse nematodefauna en opbou van 'n permanente Nasionale Versameling met aandag aan ekologie en invloed op grondvrugbaarheid. 1962. Ester van den Berg, Jadmiga Plisko
- (A)PS-Pr.21: Studies met stikstofbindende bakterieë in Suid-Afrikaanse gronde:
- 21/2: - Uittoets van kommersiële peulplantentstowwe. 1967. B.W. Strydom, H.J. van Rensburg
- 21/7: - Selektoring van *Rhizobium*-rasse vir entstofvervaardiging. 1968. B.W. Strydom, C.J. Otto
- 21/16: - Seleksie van weerstandbediende *Rhizobium*-rasse teen ongunstige klimaatstoestande. 1974. H.J. van Rensburg, B.W. Strydom
- 21/18: - Ondersoek na die rol wat lektiene speel by spesifisiteitsbepaling van rhizobia. 1973. I.J. Law, B.W. Strydom
- 21/19: - Ontwikkeling van metodes vir die seleksie van *Rhizobium*-rasse vir entstowwe. 1975. H.J. van Rensburg, B.W. Strydom
- 21/20: - Relative importance of nitrogen-fixing ability in *Rhizobium* strain selection. 1976. I.J. Law, B.W. Strydom
- 21/21: - Bepaling van simbiotiese verwantskappe tussen verskillende genetiese lyne van *Medicago truncatula*. 1977. C.P. Snyman, B.W. Strydom
- (A)PS-Pr.44: Bydrae van vrylewende stikstofbindende mikroörganismes tot Suid-Afrikaanse gronde:
- 44/1: - Evaluering van stikstofbinding by grasse wat vir weidingsdoeleindes aanbeveel word. 1975. J.L. Staphorst, B.W. Strydom
- 44/2: - Evaluering in natuurlike ekosisteme van stikstofbinding by veldgrasse wat nie in aangeplante weidings gebruik word nie. 1975. J.L. Staphorst, B.W. Strydom
- H-Ps.256: The meiofauna of soils in the Winter Rainfall Region:
- 256/1: - Taxonomy and ecology of the Collembola in the Winter Rainfall Region. 1966. M.C. Walters

VOORBEREIDINGSTUDIES/PREPARATION STUDIES

- N-Ce.141: Wet land development in the Natal Region:
- 141/1: - Evaluation of ridge and furrow technique for wetland development. 1975. D.M. Scotney, A.D. Lyle, P.A.F. Wilby

VRUGBAARHEID/FERTILITY

- (A)S-Pr.53: Nasionale koördinering en navorsing in verband met die bemestingsadviesdienste ten behoeve van boere:
- 53/1: - Koördinering van die bemestingsadviesdienste in die Republiek van Suid-Afrika. 1976. A.J. van der Merwe
 - 53/2: - Grondvrugbaarheidstatus van die gronde van die Republiek van Suid-Afrika. 1975. A.J. van der Merwe
- N-Ce.106: Fertility studies of the major soil series in Natal:
- 106/21: - N, P and K economic optima for maize grown on a Msinga sandy clay loam. 1972. M.P.W. Farina, P. Channon
 - 106/22: - N, P and K economic optima for maize grown on a Bergville sandy clay loam. 1972. M.P.W. Farina, P. Channon
 - 106/23: - Zinc, boron and copper requirements of maize grown on an Avalon medium sandy loam. 1972. M.P.W. Farina, P. Channon
 - 106/25: - Comparison of four phosphate carriers for maize on an Avalon medium sandy loam. 1973. M.P.W. Farina, P. Channon
 - 106/26: - N and P economic optima for maize grown on an Avalon medium sandy loam. 1973. M.P.W. Farina, P. Channon
 - 106/27: - N, P and K economic optima for maize grown on a Normandien sandy clay loam. 1973. M.P.W. Farina, P. Channon
 - 106/29: - N, P and K economic optima for maize grown on a Farningham clay loam. 1975. M.P.W. Farina, P. Channon
 - 106/30: - Amelioration of acidity in a Farningham clay loam and establishment of lime requirement indices for maize. 1976. M.P.W. Farina, P. Channon
- (S)WP.180: Organiese materiaal en grondvrugbaarheid:
- 180/2: - Grondvoorbereiding met kompos. 1972. G.K. Schliemann
 - 180/3: - Evaluation of municipal compost. 1971. G.K. Schliemann
 - 180/4: - Grondvoorbereiding vir appels in die Langkloof. 1972. G.K. Schliemann
 - *180/5: - Destruction of weeds in municipal compost. 1974. G.K. Schliemann

Agrohidrologie/Agrohydrology

- (A)S-Pr.51: Studies on the amelioration of liquid wastes and their disposal on land in reducing water pollution:
- 51/2: - Methods of ameliorating the acid mine water problem in South Africa. 1979. J.G. Thompson
 - 51/3: - Effectiveness of soils in reducing water pollution when effluents are disposed of on land. 1979. J. G. Thompson
- (A)S-Pr.52: Wiskundige modelle vir die bestudering van hidro - soutvloeistelsels:
- 52/2: - Breërivier tussen Brandvleidam en Robertson. 1979. H.M. du Plessis, J.L. Hutson, B.H.A. Schloms, P.F. Fuls.
- (S)WI.56: Besproeiing- en vogstudies van wingerd vir wynmaak en droogdoeleindes:
- 56/3: - Optimale benutting van beperkte besproeiingswater deur middel van besproeiings- en bewerkingsmetodes. 1978. J.L. van Zyl

Landbouweerkunde/Agrometeorology

EVAPOTRANSPIRASIESTUDIES/EVAPOTRANSPIRATION STUDIES

- (A)S-Pr.44: Determination of the evapotranspiration and water use of plants by means of weighing lysimeters:
- 44/1: - Design and construction of lysimeters. 1973. J.L. Hutson
- (S)N.99: Studie van grondvoghuishouding in verskillende grondsoorte onder verbouing van subtropiese gewasse:
- 99/1: - Verdampingstenks as maatstaf van evapotranspirasie by sitrus. 1968. G.S. Bredell
- 99/3: - Macadamia. 1976. G.S. Bredell

HAEL/HAIL

- (A)S-Pr.54: Agroklimaat van die Hoëveld- en OVS-streke:
- 54/2: - Identifikasie en klassifikasie van haelsones. 1976. A.L. du Pisani

KLIMAAT/CLIMATE

- (A)S-Pr.50: Agroklimaatbepaling in die Republiek van Suid-Afrika:
- 50/2: - Waarskynlike maandelikse reënval. 1973. A.L. du Pisani, A.V. Kotze, A.P.J.J. Kloppe
- 50/11: - Agroklimaat van subtropiese gewasse. 1977. A.L. du Pisani, A.J. Joubert
- 50/12: - Insameling en verwerking van klimaatsgegevens. 1978. A.V. Kotzé
- 50/13: - Bepaling en klassifisering van natuurlike reënval se vogpotensiaal. 1978. A.L. du Pisani
- 50/14: - Klassifikasie van temperatuur vir landbou. 1979. J. Myburgh
- (A)S-Pr.57: Invloed van weersfaktore op die groei, ontwikkeling en produksie van gewasse:
- 57/1: - Voorspelling van fenologiese gebeurtenisse: Korrelasie tussen weerfaktore en plukdatum van appels. 1973. G.W. Matthee
- 57/3: - Agroklimaat van die Hoëveld- en OVS-streke: Wisselwerking tussen makro- en mikroklimaat en die groei van mielies. 1974. J.F. Erasmus
- 57/4: - Invloed van klimaat. 1974. G.W.E.A. Garlipp, H.G. van Heerden, G.C. Theron, M.C. Dippenaar
- (A)S-Pr.58: Verbetering van mikroklimaat:
- 58/2: - Mikroklimaatstudie van die Theewaterskloofdamterrein. 1972. G.K. Viljoen
- K-Gf.117: Invloed van klimaat op plantegroei in die Karoo:
- 117/1: - Ses veldsoorte op Landboukollege Grootfontein. 1970. J.M. Torr

REËNVAL/RAINFALL

- (A)S-Pr.50: Agroklimaatbepaling in die RSA:
- 50/15: - Kartering van maandelikse gemiddelde reënval vir die Winterreënvalstreek. 1979. R. Verloren van Themaat

WINDSKERMSTELSELS/WIND-BREAK SYSTEMS

- (A)S-Pr.58: Windletsels by sitrusvrugte:
 58/3: - Verbetering van mikroklimaat: Beskerming van groente met windskatte. 1977. J. Myburgh, A. Comrie
 58/5: - Wind surveys in areas concerned. 1969. S.J. Bozalek, C.P. Welgemoed
 58/6: - Evaluation of windbreaks. 1974. S.J. Bozalek, C.P. Welgemoed, J.P. Carstens

HULPBRONBEWARING/RESOURCE CONSERVATION

Grondbewing/Soil Conservation

- (A)L-M1.23: Stabilisering van slote:
 23/1: - Stabilisering met plantegroei ondersteun deur klein meganiese strukture (Nieuwejaarspruit). 1968. S.W. Jacobsz, C.P.M. de Villiers
 23/2: - Stabilisering met groot onderdalwegwerke en plantegroei. 1968. S.W. Jacobsz, C.P.M. de Villiers
 23/3: - Stabilisering met plantegroei ondersteun deur klein meganiese strukture (Paardeverlies). 1972. S.W. Jacobsz, C.P.M. de Villiers
 (A)L-M1.24: Studie van sedimenthellings en die opbouing daarvan stroom-op van grondbewaringswerke. 1958. F.S. Greyvenstein, C.P.M. de Villiers
 (A)L-M1.54: Ontwerpsnorme vir grondbewaringstrukture, Winterreënstreek:
 54/1: - Ontwikkeling van reënvalintensiteitsfrekwensiekurwes. 1976. J.F. la G. Mattheë
 54/2: - Evaluasie van polietileen-bedekte afleibaan. 1976. J.F. la G. Mattheë
 54/3: - Evaluasie van betonafleibane in die Swartland. 1976. J.F. la G. Mattheë
 H-Ps.254: Vestiging van dekgewasse en stabilisering van gronde vir waterafloopbeheer:
 254/2: - Evaluasie van 'n aantal grasse vir aanplanting op 'n waterbaan op 'n Avalongrondvorm in die Oos-Vrystaat. 1978. C.S. Dannhauser
 *H-V1.16: Afloopbeheerbeplanning in die ontwikkelingsgebied:
 *16/1: - Losdoorns. 1976. H.J. van Staden, A.H. Versfeld
 *16/2: - Vermaas. 1975. H.J. van Staden, A.H. Versfeld
 *16/3: - Argent. 1975. H.J. van Staden, A.H. Versfeld
 *16/4: - Clocolan. 1976. H.J. van Staden, A.H. Versfeld
 *16/5: - Roadside. 1975. H.J. van Staden, A.M. Versfeld
 *16/6: - Rooipoort. 1975. H.J. van Staden, A.M. Versfeld
 *16/7: - Rooiwal. 1976. H.J. van Staden, A.H. Versfeld
 N-Ce.139: Systems specifications and simulations for extension use:
 139/4: - Run-off and soil loss estimation model. 1976. D.M. Scotney, J.B. Mallett, R.I. Jones, P.J. McPhee, H. Elwell
 N-V1.22: Runoff control planning in Natal Region: Determination of priority for runoff control planning in blocks:
 22/1: - In the Howick extension area and planning of runoff control Block 1. 1979. M.G. Price

- 22/ 2: - In the Greytown extension area and planning of runoff control Block 1. 1979. R.C. Richardson
- 22/ 3: - In the Ixopo extension area and planning of runoff control Block 1. 1979. A.D. Simpson
- 22/ 4: - In the Pongola extension area and planning of runoff control Block 1. 1979. W.B. Vosloo
- 22/ 5: - In the Kokstad extension area and planning of runoff control Block 1. 1979. H.H. Maartens
- 22/ 6: - In the Richmond extension area and planning of runoff control Block 1. 1979. E.M.F. McAllister
- 22/ 7: - In the Ladysmith extension area and planning of runoff control Block 1. 1979. A.M. Sammon, M.V. Watrus
- 22/ 8: - In the Newcastle extension area and planning of runoff control Block 1. 1979. T. Collyer
- 22/ 9: - In the Vryheid extension area and planning of runoff control Block 1. 1979. J. J. Vorster
- 22/ 10: - In the Estcourt extension area and planning of runoff control Block 1. 1979. J.H. Dugmore
- 22/ 11: - In the Dundee extension area and planning of runoff control Block 1. R.J.D. Dicks
- 22/ 12: - In the Pietermaritzburg extension area and planning of runoff control Block 1. P.J.D. Nicholson
- 22/ 13: - In the Underberg extension area and planning of runoff control Block 1. 1979. A.V. Williamson
- OK-VI.14: Beskerming van bewerkte grond teen erosie:
 - 14/ 4: - Vestiging van droëlandusern op bewerkte grond in die voorligtingswyk Molteno. 1972. I.W. van der Merwe
 - 14/ 5: - Stutterheim magisterial district. 1973. B. Denyer
 - 14/ 6: - Kontoerprogram vir bewerkte grond in die landdrosdistrik Alexandria. 1970. R.P. Laing, J.P. van Zyl
 - 14/ 8: - Beskermingsprogram in die Elandsriviergebied. 1970. L.O. Grobler
 - 14/ 10: - Voorligtingswyk Barkly-Oos. 1972. J.C. Scheltema
 - 14/ 12: - Voorligtingswyk Aliwal-Noord. 1973. J.C. van der Walt
 - 14/ 13: - Voorligtingswyk van Dordrecht. 1973. D.W. Schoeman
 - 14/ 14: - Erosiebeheer deur boere te oorrede tot beskerming van pynappellande in Oos-Londen en Komgha. 1978. A.J. Wild
- I-VI.35: Ontwikkeling van aangepaste boerderystelsels vir die Transvaalstreek:
 - 35/ 3: - Ontwerp van 'n volledige waterafloopbeheerstelsel vir die Eerstegoudteikengebied. 1975. S.W.Ackerman
 - 35/ 5: - Ontwerp van 'n waterafloopbeheerstelsel vir die Strydomblokteikengebied. 1975. C.O. Loubser
 - 35/ 6: - Ontwerp van 'n waterafloopbeheerstelsel vir die Sabievalleiegebied. 1975. D.W. Nell
 - 35/ 11: - Ontwerp van 'n waterafloopbeheerstelsel vir die Badplaaskomteikengebied. 1975. K.P. de Beer

- *35/12: - Ontwerp van 'n waterafloopbeheerstelsel vir die Van der Merwedrifteikengebied. 1975. H.P. van Dulk
- 35/13: - Ontwerp van waterafloopbeheerstelsel vir die Kleinkomatiteikengebied. 1975. J.E. Farrell
- 35/16: - Ontwerp van 'n waterafloopbeheerstelsel vir die Kendalteikengebied. 1975. G.J. Mentz
- 35/18: - Ontwerp van 'n waterafloopbeheerstelsel in die Bokpoortteikengebied. 1975. J. Bellingan
- 35/19: - Ontwerp van 'n waterafloopbeheerstelsel vir die Annyspruitteikengebied. 1975. F.J. Etsebeth
- 35/20: - Ontwerp van 'n waterafloopbeheerstelsel vir die Groot Olifantsteikengebied. 1975. D.W. Niemand
- 35/25: - Ontwerp van 'n waterafloopbeheerstelsel vir die George's Valleyteikengebied. 1976. C.P.J. de Jager
- 35/27: - Ontwerp van 'n waterafloopbeheerstelsel vir die Vlooiokteikengebied. 1977. C.F.R. Swart
- 35/28: - Ontwerp van 'n doeltreffende waterafloopbeheerbeplanning vir die Almateikengebied. 1977. J.T. Nel
- T-VI.36: Kommunikasie van aangepaste boerderystelsels in die Transvaalstreek:
- 36/4: - Kommunikasie van 'n doeltreffende afloopbeheerbeplanning vir die Kafferspruitteikengebied. 1976. A.J. Smit
- W-VI.14: Meganiese beskerming van landbougrond in die Winterreënstreek:
- 14/1: - Cereskontoerprojek. 1971. W.F. Marais
- 14/3: - Erosiebestryding in die Bo-Langkloof. 1974. C.J. Meiring
- 14/4: - Caledonvoorligtingswyk. 1974. J.J. Swart
- 14/6: - Hidrologiese beplanning van die Hartenbosdamopvanggebied. 1972. D.J. Windsor
- 14/7: - Meganiese beskerming van landerye in die hoër reënvalstreek van Heidelberg (Kaapprovinsie) en Riversdale. 1974. J. Kemp
- 14/8: - Meganiese beskerming van landerye in die Swellendamvoorligtingswyk. 1974. J.P. Pietersen, O.S. Lategan
- 14/9: - Erosiebestryding in die Bredasdorpvoorligtingswyk. 1975. P.R. Visser
- 14/10: - Afleibaanprogram - Durbanville. 1975. D. Muller, D.J. Venter, F.O. Haasbroek
- 14/13: - Program vir die beskerming van skuinsgronde in die Koppiesveld-Vredenburggrondbewaringsgebied. 1974. C.F. Vermeulen
- 14/14: - Program vir die beskerming van skuinsgronde in die koringwyk van die Mooresburggrondbewaringsgebied. 1974. C.F. Vermeulen
- *14/15: - Program vir die stabilisasie van waailande - Hopefield- en Vredenburggrondbewaringsgebied. 1974. C.F. Vermeulen
- 14/17: - Winderosiebestryding - Graaffwater. 1975. J.J. de Wet
- 14/18: - Meganiese en biologiese beskerming van saai grond in die Wellingtonse voorligtingswyk. 1973. A.G. Snyman
- 14/19: - Meganiese en biologiese beskerming van saai gronde in die Tulbagh-grondbewaringsgebied. 1973. W. de V. Alheit
- 14/21: - Waterafloopbeheer in die Outeniquagebied. 1976. J.H. Blomerus

- 14/23: - Erosiebestryding op saailande - Montaguvoorligtingswyk. 1975. D.J. de Wit
W-Vl.15: Bepaling van die braksituasie in die Winterreënstreek:
- 15/2: - Karakterisering van verbrakte besproeiingsgronde en -water in die
Oudtshoornvoorligtingswyk. 1974. P.C. van Rooyen
- 15/3: - Sistematiese ondersoek na die gehalte van besproeiingswater in die
Montaguvoorligtingswyk. 1973. W.J. Basson
- 15/4: - Program vir die herwinning van brak in die Moorreesburg- en Hopefield-
grondbewaringsgebied. 1974. C.F. Vermeulen
- 15/5: - Optimale landboukundige benutting van nat- en brakgronde deur fisiese
beplanning. 1975. F.J. Saayman
- W-Vl.16: Weidingsontwikkelingsprogram vir die Winterreënstreek:
- 16/6: - Erosiebestryding op saailande - Montaguvoorligtingswyk. 1975. D.J. de Wit
- K-Gf.144: Veldherwinning:
- 144/1: - Benutting en bestuur van *Phragmites australis* (fluitjiesriet). 1978. P. Botha

ONKRUIDBEKAMPING/WEED CONTROL

Onkruid en Gifplante/Weeds and Poisonous Plants

(Kyk ook Plantbeskerming/See also Plant Protection)

LITJIESKAKTUS/JOINTED CACTUS

- OK-Do.86: Chemical control of *Opuntia* spp.:
- 86/1: - Study of the physiological and morphological characteristics of *Opuntia*
aurantiaca. 1977. B.H. Whiting
- 86/2: - Evaluering van belowende watermengbare onkruidodders vir die beheer van
Opuntia aurantiaca. 1979. A.J. Aucamp

NASSELLA

- OK-Do.68: Control of undesirable plant species in natural vegetation:
- 68/7: - Spraying and burning of nassella. 1977. J.H. l'ons
- *68/8(K): - Application of glyphosate on nassella at different times and rates. 1977.
D.C. Joubert
- 68/9(K): - Screening species for replacing nassella. 1978. C.J.G. le Roux
- 68/10(K): - Evaluation of nassella eradication treatments. 1978. A.J. Aucamp
- W-Sb.159: Bestryding van nassellapolgras in die Winterreënstreek

BOSINDRINGING/BUSH ENCROACHMENT

- SW-Om.4: Ontwikkeling van die verboste gebiede in Suidwes-Afrika:
- 4/1(K): - Chemiese uitroeiing van indringerbosse deur middel van lugbespuiting. 1974.
J.P. van Niekerk

CYPERUS SPP.

- (A)T-Rp.115: Onkruidbestryding in tuingewasse:
115/1: - Bestryding van uintjies (*Cyperus* spp.). 1967. O.J. Olivier, P.J. Henrico

DICHAPETALUM

- (A)P-Pr.20: Plantkundige aspekte van gifblaar, *Dichapetalum cymosum*, in die Transvaalstreek:
20/1: - Morfologiese en ekologiese studie in die Pretoria-omgewing. 1968. J. Vahrmeijer
SW-Sp.1: Beperking van veeverliese as gevolg van gifblaar (*Dichapetalum cymosum*) vergiftiging:
1/1: - Invloed van beweidingsintensiteit, kampstelsels en proteïenaanvulling op die uitskakeling van die nadelige effek van gifblaar. 1966. J.P. van Niekerk

GRAMINEAE

- W-Sb.77: Chemical weed control in winter cereal crops:
77/5: - Chemical and cultural control of *Avena*, *Bromus*, *Lolium* and other problem weeds in small grain in the Winter Rainfall Region. 1974. A.L.P. Cairns, J.E. Wicht

HAKEA

- (A)P-Sb.5: Botanical survey of the mountain fynbos of South Africa:
5/2: - Distribution and autecological aspects of the *Hakea* pest plants, *H. sericea*, *H. gibbosa* and *H. suaveolens*. 1976. S.R. Fugler

LANTANA

- (A)P-Pr.40: Cytotaxonomic study of *Lantana camara* L. (Verbenaceae) in South Africa. 1975. C.H. Stirton

PACHYSTIGMA

- H-Ps.118: Gousiekteprobleem:
118/8: - Effect of fertilization on *Pachystigma pygmaeum*. 1971. R.H. Drewes
118/9: - Growth and development of *Pachystigma pygmaeum*. 1971. R.H. Drewes
118/10: - Fenac-konsentrasies by die beheer van *Pachystigma pygmaeum*. 1971. G. Coetsee
118/11: - Invloed van kampgrootte en weidruk op gousiektevergiftiging. 1972. G. Coetsee

PROSOPIS

- K-Gf.126: Plantekologie:
*126/2: - Opname van *Prosopis*-verspreiding in die Karoostreek. 1977. M. Vorster
K-Gf.143: Beheer van indringerplante:

- 143/1:(K): - Chemiese beheer van mesquite *Prosopis* spp. in die Noordwes-Karoo. 1977. M. Vorster

SENECIO

- OK-Do.68: Beheer van ongewenste plantspesies in natuurlike plantegroei:

MIDDELS/HERBICIDES

- (A)T-Rp.142: Invloed van temperatuur op die uitwerking van onkruidmiddels op verskillende cultivars van groentegewasse. 1972. W.M.D.R. Meissner

ALGEMEEN/GENERAL

- W-Sb.77: Chemical weed control in winter cereal crops:
 77/6: - Chemiese vooropkomsonkruidbeheer in wintergewasse. 1977. J.W. Loubser
 77/8: - Chemiese onkruidbeheer in peulgewasweidings onder droëlandverbouing in die Winterreënstreek. 1979. J.W. Loubser, J.D. Langenhoven

**ONDERNEMERSONTWIKKELING/
ENTREPRENEUR DEVELOPMENT**

VOORLIGTING/EXTENSION

BEESEVLEISPRODUKSIE/BEEF PRODUCTION

- N-VI.17: Promotion of beef production in the Natal Region:
 *17/2: - Promotion of the economic intensification of beef production in the Swartberg section of East Griqualand in bioclimatic groups 4f and 4e. 1974. A.R. Bischof
 17/4: - Reclamation and utilization of Weenen Thornveld for beef production in the Weenen soil conservation district. 1974. B.A. Scott
 17/6: - Promotion of beef production in the Melmoth soil conservation district in bioclimatic groups 2a, 2b and 10a. 1975. D.A. Steynberg

BESPROEIINGSBOERDERY/IRRIGATION FARMING

- W-Sb.147: Optimale hulpbronbenutting in die Winterreënstreek:
 147/6: - Gebruiksklassifikasie van besproeibare gronde in die Riviersonderendvallei. 1977. F.J.J. Carstens, C.P. de L. Beyers, J. Terblanche
 147/8: - Breërivierbesproeiingspotensiaalstudie. 1977. A.F. Kriel, D.J. v. Z. Smit

BEWARINGSBOERDERY/CONSERVATION FARMING

- OK-Do.74: Evaluation of the stock reduction scheme:
 74/1: - Vegetation changes. 1972. T. Daines

BOERDERYBEPLANNING/FARM PLANNING

- K-VI.10: Boerderybeplanning:
 *10/1: - Versorging van grondbewaringswerke in die voorligtingswyk Colesberg. 1974. M. van Niekerk
- K-VI.11: Opvanggebiedsbeplanning:
 11/1: - Onderzoek na die potensiaal van landbouhulpbronne in die subopvanggebied Brakspruit. 1975. M. van Niekerk
- O-VI.12: Ontwikkeling en bevordering van aangepaste boerderystelsels in die Oranje-Vrystaatstreek:
 *12/2: - Implementering van voorgestelde plaasbeplanning in die subopvanggebied Nuwejaarspruit. 1974. C.J. Wilken

BOERDERYPRAKTYKE/FARMING PRACTICES

- O-VI.12: Ontwikkeling en bevordering van aangepaste boerderystelsels in die Oranje-Vrystaatstreek:
 12/1: - Studie oor produksietegnieke en opbrengsnorme in die voorligtingswyk Zastron. 1974. C.J. Wilken
- OK-VI.18: Bevordering van rooivleisproduksie in die Oos-Kaapstreek:
 18/1: - Voorligtingswyk Aliwal-Noord. 1974. F.P. Nel
- T-VI.35: Ontwikkeling van aangepaste boerderystelsels vir die Transvaalstreek:
 35/1: - Doeltreffendheid van varsmelkboerdery in Suidos-Transvaal. 1975. J.C. Louw
- 35/7: - Ontwikkeling van 'n doeltreffende aangepaste boerderystelsel vir die Strydomblokteikengebied. 1975. P.J. du Toit
- 35/8: - Ontwikkeling van 'n doeltreffende aangepaste boerderystelsel vir die Sabievalleiteikengebied. 1975. C.C. Engelbrecht
- 35/10: - Ontwikkeling van 'n aangepaste boerderystelsel vir die Kendalgebied. 1975. J.S. Leonard
- 35/14: - Ontwikkeling van 'n aangepaste boerderystelsel vir die Groot Olifantsteikengebied. 1975. M.J. Bekker
- *35/22: - Ontwikkeling van 'n aangepaste boerderystelsel vir die George's Valleyteikengebied. 1976. I. Jansen van Rensburg
- 35/24: - Development of adapted farming systems for the Letaba Bushveld target area. 1977. W.B. Noel
- 35/29: - Ontwerp van aangepaste boerderypraktyke vir die Watervalsrivierteikengebied. 1977. B.P. Swart
- T-VI.36: Kommunikasie van aangepaste boerderystelsels en praktyke in die Transvaalstreek:
 36/2: - Kommunikasie van verbeterde veeboerderypraktyke in die Koedoesrandteikengebied. 1976. S.W. Burger
- W-Lg.13: Optimum integration of farming practices:
 13/1: - Swartland optimum land utilization and management trial. 1972. J.E. Wicht, T.T. de Villiers, M.D. Strauss, J.M. van Heerden
- 13/2: - Evaluation of practices to determine the most suitable cultivation for optimum yield in different wheat rotation systems as practised in the Swartland. 1975. J.E. Wicht, J.H. Loots, M.M. Landman

- W-Vl.19:
19/1: Gebiedsontwikkeling in die Drakensteinvoorligtingswyk:
- Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Drakenstein. 1979. P.M. Burger
- 19/2: - Opbrengsnorme en produksietegnieke: Drakensteinwyk. 1978. P.M. Burger
- W-Vl.21: Gebiedsontwikkeling in die Robertsonvoorligtingswyk:
21/1: - Afbakening van redelik homogene boerderygebied: Robertsonwyk. 1978. J.J. de Wet
- W-Vl.23: Gebiedsontwikkeling in die Wellingtonvoorligtingswyk:
23/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Wellington. 1978. D.M. du Toit
- 23/2: - Opbrengsnorme en produksietegnieke van langtermyngetasse in die Wellingtonvoorligtingswyk. 1979. D.M. du Toit
- W-Vl.24: Gebiedsontwikkeling in die Worcestervoorligtingswyk:
24/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Worcester. 1978. G.G. van der Merwe
- 24/2: - Opbrengsnorme en produksietegnieke: Worcesterwyk. 1978. G.G. van der Merwe
- W-Vl.26: Gebiedsontwikkeling in die Ladismithvoorligtingswyk:
26/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Ladismith, KP. 1978. M.J. de W. Delpont
- W-Vl.27: Gebiedsontwikkeling in die Montaguvoorligtingswyk:
27/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Montagu. 1978. W.J. Basson
- W-Vl.28: Gebiedsontwikkeling in die Oudtshoornvoorligtingswyk:
28/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Oudtshoorn. 1978. B.F.A. Visser, C.J. Nel
- W-Vl.33: Gebiedsontwikkeling in die Bredasdorpvoorligtingswyk:
33/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Bredasdorp. C.W.G. Goldswain
- W-Vl.34: Gebiedsontwikkeling in die Caledonvoorligtingswyk:
34/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Caledon. 1979. F.J.J. Carstens
- W-Vl.35: Gebiedsontwikkeling in die Georgevoorligtingswyk:
35/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk George. 1978. J.H. Blomerus, W.G.J. Voigt
- W-Vl.38: Gebiedsontwikkeling in die Swellendamvoorligtingswyk:
38/1: - Afbakening van redelik homogene boerderygebiede in die voorligtingswyk Swellendam. 1978. J.P. Pietersen

BOERDERYREKORDS/FARMING RECORDS

- W-Vl.17: Bevordering van landbouproduksie in die Winterreënstreek:
17/30: - Boerderyrekords vir Bredasdorp. 1973. D. Joubert, A. Marais, C.W.G. Goldswain

GEWASPRODUKSIE/CROP PRODUCTION

- N-Vl.16: Promotion of maize production in the Natal Region:
- 16/2: - Promotion of maize yields in bioclimatic group 8 in the Dundee soil conservation district. 1974. R.H. Read
 - 16/7: - Promotion of improved maize yields in bioclimatic areas 2 and 3 of the Greytown extension area. 1975. D.L. Thibaud
- W-Vl.17: Bevordering van landbouproduksie in die Winterreënstreek:
- 17/7: - Koringverbouing in die Georgevoorligtingswyk. 1973. W.G.J. Voigt
 - 17/25: - Kleingraandemonstrasieproewe in die Caledonvoorligtingswyk. 1976. F.J.J. Carstens
 - 17/28: - Koringcultivardemonstrasies. 1972. L.M. Smit, C.W.G. Goldswain

GRONDGEBRUIK/LAND USE

- N-Vl.15: Investigation of the Natal extension service for the promotion of optimum land-use:
- 15/1: - Human potential in relation to optimum land-use. 1975. D.M. Rix
- N-Vl.20: Surveys of land-use and farming enterprise in Natal:
- 20/1: - Present land-use survey in Natal. 1979. D.M. Scotney

GRONDKLASSIFIKASIE/SOIL CLASSIFICATION

- H-Vl.14: Grondklassifikasie in ontwikkelingsgebiede in die Hoëveldstreek:
- 14/1: - Clocolan. 1974. G.B. Steyl, G. Postma, J.E. Volschenk
 - 14/2: - Aberfeldy. 1974. B.H. Koch, J.E. Volschenk
 - 14/3: - Roadside. 1974. B.H. Koch, J.E. Volschenk
 - 14/4: - Vlakfontein. 1974. J. Joubert, J.E. Volschenk
 - 14/7: - Rooiwal. 1974. J.N. Mans, A.G.H. Kotzé, J.E. Volschenk
 - 14/9: - Vierfontein. 1974. P.W.B. Joubert, J.E. Volschenk
 - 14/10: - Diamantdoorns. 1975. A.H. Meyer, D.C.J. Uys, J.E. Volschenk
 - 14/12: - Rooipoort. 1974. J. Joubert, J.E. Volschenk
 - 14/13: - Rooikrans. 1974. G.B. Steyl, J.E. Volschenk
 - 14/14: - Eloff. 1974. L.M. le Roux, E.W. Hagedorn, J.E. Volschenk
 - 14/15: - Grondklassifikasie in ontwikkelingsgebied Kameelpan. 1975. A.H. Meyer
 - 14/16: - Grondklassifikasie in ontwikkelingsgebied Deelpan. 1975. J.N. Mans
 - 14/17: - Grondklassifikasie in ontwikkelingsgebied Grootvlei. 1975. L.M. le Roux
 - 14/18: - Grondklassifikasie in ontwikkelingsgebied Dundas. 1976. B.H. Koch
 - 14/19: - Grondklassifikasie in ontwikkelingsgebied Bloukop. 1976. G.B. Steyl
- W-Sb.147: Optimale hulpbronbenutting in die Winterreënstreek:
- 147/3: - Ondersoek na die natuurlike hulpbronne deur middel van grondklassifikasie met die oog op plaasbeplanning. 1975. J. van Zyl
- W-Vl.15: Bepaling van die braksituasie in die Winterreënstreek:

- 15/6: - Gebruiksklassifikasie van besproeiingsgronde in die Kingnariviervallei, Montaguvoorligtingswyk. 1977. W.J. Basson

LANDBOUHULPBRONNE/AGRICULTURAL RESOURCES

- K-VI.16: Landbouhulpbronontwikkeling:
- *16/1: - Die rol van strewe as gedragsbepalende faktor by oortreders van die Grondbewaringswet in die Karoostreek. 1975. M.L. Heyns
- 16/2: - Studie van landboupotensiaal van Grassridgedamopvanggebied in die Bo-Visrivierbekken. 1975. E.M. Meyer
- 16/3: - Studie van landboupotensiaal in die subopvanggebied van Loxton in die Sakrivieropvanggebied. 1974. C.F. Visser, G.J.Z. Barnard

METODIEK/METHODOLOGY

- T-VI.37: Evaluasie van voorligtingsmetodieke in Transvaalstreek:
- 37/1: - Evaluasie van kommunikasietegnieke in geprogrammeerde voorligting te Thabazimbi-Bosveld. 1978. G.J.G. du Plooy

STELSELSPEKIFIKASIES/SYSTEM SPECIFICATIONS

- N-Ce.139: Systems specifications and simulations for extension use:
- 139/1: - Beef feeding simulator. 1975. R.I. Jones, S.F. Lesch, B.P. Louw
- 139/3: - Beef breeding herd simulator. 1976. B.J. Lyle, R.I. Jones, B.P. Louw, S.F. Lesch
- 139/6: - *Eragrostis curvula* production model. 1977. N.G.E. Hackland

SUIWELPRODUKSIE/DAIRY PRODUCTION

- W-VI.17: Bevordering van landbouproduksie in die Winterreënstreek:
- *17/10: - Suiwelproduksieprogram in die George-voorligtingswyk. 1973. J.H. Blomerus
- 17/21: - Rekordhouding en die identifiseering van knelpunte in die suiwelbedryf in die Koeberg. 1975. F.O. Haasbroek

VELDBESTUUR/VELD MANAGEMENT

- K-VI.9/1: Veldverbetering: Evaluasie van die invloed van die veeverminderingkema op die veld in die voorligtingswyk:
- 9/1/1: - Cradock. 1972. M. Vorster
- 9/1/3: - Jansenville. 1972. I. du T. van der Merwe
- 9/1/4: - Somerset-Oos. 1972. F. Botha
- 9/1/5: - Burgersdorp. 1972. C.A. du Toit
- 9/1/6: - Colesberg. 1972. M.G. van Niekerk
- 9/1/7: - De Aar. 1972. J.G.M. van der Merwe
- 9/1/8: - Middelburg, Kaapprovinsie. 1972. M.J.A. Coetsee
- 9/1/9: - Calvinia. 1972. N. Nortjé
- 9/1/10: - Carnarvon. 1972. W. van D. Botha

- 9/1/11: - Kenhardt. 1972. D.J. Steenkamp
 9/1/12: - Prieska. 1972. D.J. Roux
 9/1/13: - Beaufort-Wes. 1972. A.P. Wiid
 9/1/14: - Fraserburg. 1972. C.B. Reitz
 9/1/15: - Laingsburg. 1972. I.J. van der Merwe
 9/1/16: - Victoria-Wes. 1972. H.R. Becker
- K-VI.9/2: Veldverbetering: Evaluasie van produktiwiteit van vee as gevolg van deelname aan die veeverminderingkema in die voorligtingswyk:
- 9/2/1: - Cradock. 1972. M.H. Vorster
 9/2/2: - Graaff-Reinet. 1972. W.S. Looock
 9/2/3: - Jansenville. 1972. I. du T. van der Merwe
 9/2/4: - Somerset-Oos. 1972. F. Botha
 9/2/5: - Burgersdorp. 1972. C.A. du Toit
 9/2/6: - Colesberg. 1972. M.G. van Niekerk
 9/2/7: - De Aar. 1972. J.G.M. van der Merwe
 9/2/8: - Middelburg, Kaapprovinsie. 1972. M.J.A. Coetsee
 9/2/9: - Calvinia. 1972. N. Nortjé
 9/2/10: - Carnarvon. 1972. W. van D. Botha
 9/2/11: - Kenhardt. 1972. D.J. Steenkamp
 9/2/12: - Prieska. 1972. D.J. Roux
 9/2/13: - Beaufort-Wes. 1972. A.P. Wiid
 9/2/14: - Fraserburg. 1972. C.B. Reitz
 9/2/15: - Laingsburg. 1972. I.J. van der Merwe
 9/2/16: - Victoria-Wes. 1972. H.R. Becker
- K-VI.12: Droogtebestande voergewasse:
- N-VI.21: Reclamation of thornveld in the Midlands Sub-region of Natal:
- 21/1: - Studies on the reclamation and utilisation of thornveld in the Mudén area. 1979. K.G. Camp
- O-VI.12: Ontwikkeling en bevordering van aangepaste boerderystelsels in die OVS-streek:
- 12/12: - Evaluering van produksiestelsels in die Kalahari-duineveld op die plaas Massakloutjie. 1977. N.J. de Wet, D.A. Boshof
- 12/13: - Bevordering van oprigting van binnekampheining in die subopvangsgebied Slyspruit. 1976. W. Jonker, A.J. van Schalkwyk
- OK-VI.13: Veldverbetering en -benutting:
- 13/1: - Gewenste grootvee tot kleinveeverhouding vir die voorligtingswyk Aliwal-Noord. 1972. O.V. Loest
- 13/2: - Wisselspaarprogram vir die voorligtingswyk Aliwal-Noord. 1972. O.V. Loest
- 13/3: - Realistiese veeladingsprogram vir die voorligtingswyk Aliwal-Noord. 1972. O.V. Loest
- 13/6: - Afkamp en behandeling van verspoelde dele in die voorligtingswyk Dordrecht. 1970. D.W. Schoeman

- 13/7: - Plaasbeplanning in die voorligtingswyk Barkly-Oos. 1973. J.C. Scheltema
- 13/8: - Bestrydingsprogram vir polgrasse (*Nassella trichotoma* en *Stipa tenuissima*) in die voorligtingswyk Barkly-Oos. 1972. J.C. Scheltema
- 13/13: - Plaasbeplanning in die voorligtingswyk Aliwal-Noord. 1973. O.V. Loest
- 13/14: - Wisselspaarprogram vir die voorligtingswyk Barkly-Oos. 1972. J.C. Scheltema
- 13/15: - Afkamp en behandeling van verspoelde dele in die voorligtingswyk Aliwal-Noord. 1970. J.C. van der Walt
- 13/16: - Wisselspaarprogram vir die voorligtingswyk Molteno. 1972. J.W. van der Merwe
- 13/17: - Plaasbeplanning in die voorligtingswyk Dordrecht. 1973. D.W. Schoeman
- 13/18: - Wisselspaarprogram vir die voorligtingswyk Dordrecht. 1973. D.W. Schoeman
- 13/20: - Plaasbeplanning in die voorligtingswyk Molteno. 1973. J.G. Stegmann
- 13/21: - Bevordering van die groepkampstelsel in die voorligtingswyk Molteno. 1973. I.W. van der Merwe
- 13/22: - Oorreding van boere tot vestiging van lusern in Queenstown. 1977. I.W. van der Merwe
- T-VI.36: Kommunikasie van aangepaste boerderystelsels en praktyke in die Transvaalstreek:
- *36/3: - Kommunikasieprogram ter bevordering van verbeterde veld- en veebestuurspraktyke. 1976. C.S. Williams
- W-VI.16: Weidingsontwikkelingsprogram vir die Winterreënstreek:
- *16/7: - Versameling van inligting betreffende weiveld en beweidingspraktyke met behulp van inligtingsgroepe - Boesmanlandgrondbewaringsdistrik. 1975. F.J.J. Brand

VRUGTE/FRUIT

- W-VI.17: Bevordering van landbouproduksie in die Winterreënstreek:
- 17/12: - Wingerdverbouing in die Montaguvoorligingswyk - Klein Karoosubstreek. 1973. W.J. Basson
- 17/14: - Wingerdverbouingsprogram in die Ladismithvoorligtingswyk. 1972. M.J. Delpont
- 17/19: - Ondersoek na verbeterde bemestingspraktyke by youngbessieverbouing. 1975. J.P. Pietersen
- *17/20: - Verbetering van die vruggrootte by kern- en steenvrugte in die Ceres-, Tulbagh- en Citrusdalvrugtegebiede. 1975. W.F. Marais

WEIDING/PASTURES

- W-VI.16: Weidingsontwikkelingsprogram vir die Winterreënstreek:
- 16/1: - Bepaling van die kwaliteit en kwantiteit van weiding in die Noordwestelike Substreek met behulp van objektiewe plantopnamemetodes. 1974. I.H. Kleingeld
- 16/2: - Weiveldverbetering in die Ladismith-Karoogrondbewaringsgebied. 1973. A.A. Schoeman

- 16/3: - Weiveldverbetering in die ekstensiewe gedeeltes van die voorligtingswyk Montagu. 1973. E.J.J. Nel
- 16/4: - Weiveldverbetering - Distrik Uniondale. 1974. C.J. Nel
- 16/5: - Veldherwinning in die Ceres-Karoogrondbewaringsgebied. 1971. W.F. Marais, P.A.B. van Breda
- 16/8: - Aanwending van aangeplante weiding op marginale gronde in die Stellenboschvoorligtingswyk, wat nie vir permanente gewasverbouing geskik is nie. 1975. B.F. Smit, P.A.B. van Breda
- 16/10: - Bevordering van meerjarige weidings in Mosselbaailandrosdistrik. 1976. W.G.J. Voigt
- 16/12(K): - Koöperatiewe grasklawerdemonstrasiepersele onder besproeiing in die Touwsriviergebied. 1978. E.J.J. Nel, W.J. Basson
- 16/14: - Aangeplante weidings: Langkloofgebied. 1978. B.F.A. Visser, W.S. van der Merwe

INGENIEURSWESE/ENGINEERING

Landboumeganisasie en Werktuie/ Agricultural Mechanisation and Implements

APPARAAT/APPARATUS

- (A)L-M1.49: Ondersoek na toerusting vir die ontwatering van vrugte en verwante plaasprodukte:
 - *49/1: - Evaluasie van die Californiese tipe droogtonnels te Citrusdal Koöperatiewe Droogbane. 1974. P.J.C. Bosch
 - *49/4: - Simulation of a Californian dehydration tunnel. 1976. P.J.C. Bosch
- (A)L-M1.52: Ontwikkeling van plaagbeheertoerusting:
 - 52/2: - Ontwikkeling van ULV-rugsaksprinkaan spuit. 1976. F.J.C. Hugo

PLAASMASJINERIE/FARM MACHINERY

- (A)L-M1.32: Amptelike toetsprogram vir wingerdspuitmasjiene in Suid-Afrika:
 - 32/16: - Toetsing van 'n derde reeks wingerdspuitmasjiene. 1977. S.J. de Weerd

Besproeiing en Dreinerings/Irrigation and Drainage

BESPROEING/IRRIGATION

- (A)L-M1.45: Ondersoek na ingenieursaspekte van drupbesproeiing in die Republiek van Suid-Afrika:
 - 45/1: - Veldopname van drupbesproeiingstelsels. 1974
 - 45/3: - Werkverrigting van mikrobuise. 1974. W.J. Uys

DREINERING/DRAINAGE

- (A)L-M1.55: Evaluasie van die ingenieursfasette van ondergrondse dreineerstelsels:
- 55/1: - Evaluering van moderne dreineringsteorie vir die ontwerp van ondergrondse dreineerstelsels in die Winterreënstreek. 1977. R.P.Perold
- 55/2: - Evaluasie van filters en omhulsels vir dreinbuise. 1978. R.P. Perold
- W-VI.14: Meganiese beskerming van landbougrond in die Winterreënstreek:
- 14/20: - Dreineringsevaluasieprogram in die Bolandsubstreek. 1977. E.J. van Schalkwyk

ONDERSTEUNENDE DIENSTE/SUPPORTING SERVICES

BOTANIE/BOTANY

Flora

BLOMPLANTE/FLOWERING PLANTS

- (A)P-Pr.6: Flowering plants of Africa. 1918. D.J.B. Killick
- (A)P-Pr.29: Revision of 'The genera of South African Flowering Plants'. 1967. R.A. Dyer
- (A)P-Pr.43: Taksonomiese hersiening van die genus *Mariscus* Vahl (fam. Cyperaceae) in Suid-Afrika. 1977. P.J. Vorster
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- (A)P-Pr.42: Palaeo-ethnobotany of the Iron and Stone Age deposits of Border Cave, Lebombo Range. 1976. J.M. Anderson
- (A)P-Pr.44: Palaeoflora of Southern Africa:
- 44/1: - Palaeoflora of the Upper Triassic Molteno Formation, Karoo Basin, South Africa. 1978. J.M. Anderson

STREEKFLORA/REGIONAL FLORA

- (A)P-Pr.3: Flora of Southern Africa. 1955. O.A. Leistner *et al*
- (A)P-Pr.35: Geïllustreerde flora van die Pretoria-distrik. 1970. O.A. Leistner, P.J. Vorster

Plantegroei/Vegetation

AKWATIESE PLANTE/AQUATIC PLANTS

- (A)P-Db.3: Ecological and ecophysiological studies on aquatic higher plants in South Africa:
- 3/1: - Classification and mapping of aquatic macrophyte communities of Natal. 1974. C.F. Musil
- 3/2: - Ecological and ecophysiological studies on higher aquatic plants in South Africa: Ecophysiological study of *Eichhornia crassipes* in Natal. 1974. C.F. Musil
- 3/3: - Preliminary survey of aquatic plants in Transvaal. 1976. R. Crawford

BOSVELD/BUSHVELD

- *(A)P-Pr.36: Phytosociological study of the Western Transvaal Sourish Mixed Bushveld with special reference to the ecology and planning of the landscape. 1976. F. van der Meulen

FYNBOS

- (A)P-Pr.45: Phytogeography of the indigenous woody plants of the Transvaal and Swaziland:
- 45/1: - Interim distribution atlas. 1970. J.M. Anderson
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- (A)P-Sb.5: Botanical survey of the mountain fynbos vegetation of South Africa:
- 5/1: - Survey of the Cape Peninsula using the method of association analysis. 1965. H.C. Taylor
 - 5/3: - Classification based on structural-functional characteristics of the vegetation. 1979. B.M. Campbell

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- (A)P-Pr.22: Stability of basal cover in natural grassland. 1966. J.W. Morris
- (A)P-Pr.23: Plant ecological survey of the Highveld Region:
- 23/1: - Preliminary work and testing of methods and procedures. 1968. J.C. Scheepers, J.W. Morris
 - 23/2: - Kroonstad area. 1968. J.C. Scheepers
 - 23/3: - Bethlehem area. 1969. J. C. Scheepers
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- (A)P-Gf.1: Veld types of South Africa. 1945. J.P.H. Acocks
- (A)P-Ph.2: Economic botany. 1945. M.J. Wells, J. Vahrmeijer
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- (A)P-Pr.38: Vegetation survey of the Zululand coastal dunes:
- *38/1: - Area between Richards Bay and the Umfolozi River. 1976. P.J. Weisser
- (A)P-Sb.8: Semi-detailed survey of the vegetation of the Western and Southern Cape Province Coastal Lowlands:
- 8/1: - Study of a number of east to west transects through the Western Cape Coastal Lowlands. 1977. C. Boucher
 - 8/2: - Description and mapping of the Western Coastal Lowlands. 1978. C. Boucher
- K-Gf.126: Plantekologie:
- 126/3: - Plantekologiese opname van die Grassridgedam-opvanggebied. 1977. M. Vorster

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- (A)P-Pr.37: South African Savanna ecosystem project:
- 37/1: - Determination of biomass relations in dominant tree and shrub species within the Savanna ecosystem project. 1975. M. Rutherford
- 37/2: - Determination of the seasonal Biomass change of dominant woody species within the Savanna ecosystem project. 1975. M. Rutherford

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- O-Gl.32: Opbou van 'n herbarium en bevordering van ekologiese studies van veldplante. 1950. L.F. Vorster, A.F.J. Visagie
- OK-Do.85: Reference herbaria in the Eastern Cape Region:
- 85/1: - Dohne. 1976. M.J. Jacobs

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- (A)P-Bm.1: Development of a botanical garden of indigenous plants. 1947. B. de Winter, J. Admiraal

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- (A)P-Pr.10: Classification of South African monocotyledons. 1960. Amalia A. Mauve
- (A)P-Pr.15: Classification of the South African Gramineae. 1961. P.C.V. du Toit
- (A)P-Pr.26: Anatomical study of the leaf and embryo of the Poaceae (Gramineae) of Southern Africa. 1972. R.P. Ellis

PLANTBESKERMING/PLANT PROTECTION

(Kyk ook betrokke gewasse en diere/See also respective crops and animals)

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- (A)I-Pr.10: Taxonomic studies of African Isoptera. 1946. J.E. Ruelle, W.G.H. Coaton
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- 78/2: - Taxonomy and distribution of South African Pseudococcoidea. 1963. G. de Lotto
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- (A)I-Pr.123: Algemene versameling: Nasionale versameling van insekte. 1972. G.L. Prinsloo
- (A)I-Pr.129: Bio-ecological studies of insects associated with Karooveld:
- 129/1: - Bio-ecological study of the Karoo caterpillar, *Loxostege frustalis* Zeller. 1975. J.D. Möhr, M.W. Pretorius
- (A)I-Pr.147: Biology and systematics of southern African Myrmeleontidae and Nemopteridae
- (A)I-Pr.150: Systematics of the Hymenoptera Aculeata of southern Africa with special reference to the Xylocopinae. 1978. C.D. Eardley
- N-Ce.120: Grondbewonende insekte (uitsluitend Isoptera) wat landbouproduksie in Natal nadelig kan beïnvloed:
- 120/1: - Insekte wat natuurlike en aangeplante weidings beskadig. 1970. P.C. Joubert
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- 46/1: - Opname by akkerbougewasse. 1977. H.H. Gouse

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- (A)I-Pr.87: Bio-ecology of the potato tuber moth:
- 87/3: - Level of control now exerted by imported natural enemies and the measures, if any, needed to improve it. 1976. E.F. Whiteside
- (A)I-Pr.103: Invloed van plaagdoders, natuurlike vyande en landboupraktyke op bevolkings van *Tetranychus cinnabarinus*, *T. ludeni* en *T. lombardinii*:
- 103/1: - Laboratoriumevaluering van kandidaat chemiese beheermiddels teenoor *Tetranychus cinnabarinus*, *T. ludeni* en *T. lombardinii*. 1978. D. Lombard
- 103/2: - Evaluering van belowende chemiese beheermiddels onder veldtoestande teen *Tetranychus cinnabarinus*, *T. ludeni* en *T. lombardinii*. 1978. J.H. Botha
- 103/3: - Voortdurende bepaling van weerstandbiedendheid van chemiese beheermiddels. 1978. D. Lombard
- (A)I-Pr.126: Systematic studies on Saturnidae. 1974. H. Geertsema
- (A)I-Pr.145: Ekologie en beheer van Amerikaanse bolwurm, *Heliothis armigera* (Hübner), in Suid-Afrika:
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- 148/1: - Amerikaanse bolwurm. 1978. H. van Hamburg
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- 158/2/2: - A survey of populations. 1976. J.M.I. Donaldson
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- H-Ps.258: Blaarspringers (Homoptera: Cicadellidae) as vektore:
- 258/2: - Bepaling van ekologiese optima vir die mieliebladspringer, *Cicadulina mbila*. 1977. G.D.J. van Rensburg
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- 70/2: - Beheer van die wingerdwitluise. 1979. C.A. de Klerk
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- 35/1: - Verspreiding, skade en telingsmetodes. 1971. H.H. Gouse
- 35/2: - Biologiese en ekologiese studies. 1971. H.H. Gouse
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- 24/1: - Gebruik van kontakmiddels vir die beheer van insekte. 1955. J.H. Viljoen
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PLAAGDODERDINAMIKA/PESTICIDE DYNAMICS

NABLYWING/PERSISTENCE

- (A)I-Pr.97: Afbreking en vermindering van plaagbeheermiddelreste:

- 97/6: - Voorkoms en nablywing in suiwelprodukte van gechlloreerde insektemiddels. 1975. Mareli Krause
- 97/8: - Die neerslag en nablywing van plaagdoders aangewend met outomatiese spuitmasjiene op sitrus. 1976. P.R. de Beer, L.P. van Dyk
- 97/9: - Residu's in rou groente en diereprodukte. 1977. L.P. van Dyk, P.R. de Beer, F.E. Pick
- 97/10: - Vergelyking van lae- en hoëvolume-handbespuiting ten opsigte van neerslag en nablywing. 1977. H. Schlebusch, M. Krause, L.P. van Dyk

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 - 111/4: - Toksisiteit van sekere plaagdoders vir kommersiële vis. 1975. C.G. Greef
 - 111/8: - Nablywing van plaagbeheermiddels in landbougrond. 1975. L.P. van Dyk
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VEROUDERING/AGEING

- (A)I-Pr.97: Afbreking en vermindering van plaagbeheermiddelreste:
 - 97/7: - Veroudering van labiele plaagdoders in verskillende formulerings en onder verskillende stoortoestande. 1975. L.P. van Dyk

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 - 112/1: - Fungicide tests. 1967. B.H. Boelema, S. Visser
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- (A)I-Pr.61: Biologiese beheer van turksvy (*Opuntia megacantha*) en litjieskaktus (*O. aurantiaca*):
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 - 61/3: - Evaluation of *Dactylopius austrinus* as a natural enemy of jointed cactus. 1976. H.G. Zimmerman
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BASKEWERS/BARK BEETLES

- (A)I-Pr.9: Bos- en struikinsekte:
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- (A)I-Pr.113: Role of insects in the pollination of seed crops in the Oudtshoorn area. 1972. R.H. Anderson
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- (A)I-Pr.112: Bio-ecology of solitary bees with reference to their importance as pollinating agents in South Africa:

- 112/1: - Carpenter bees. 1972. R.H. Watmough
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 *141/1: - Temperature relations of *A.m. adansonii*
 *141/2: - Ecology of *A.m. adansonii* in the Drakensberg mountains of Natal
 *141/3: - Development and behaviour of drones of *A.m. adansonii*
 *141/4: - Swarming behaviour of *A.m. adansonii*
 *141/5: - Absconding and "migratory behaviour" *A.m. adansonii*
 *141/6: - Natural emergency queen-rearing by the African bee, *Apis mellifera adansonii*, and its relevance to successful queen production by bee-keepers

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- (A)I-Pr.124: Siektes en plaie van die heuningby:
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 124/3: - Siektes van die volwasse heuningby. 1976. B. Buys
 124/4: - Bestandheid teen siektes en plaie in die seleksie van verbeterde lyne van heuningbye. 1975. B. Buys
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TEELLYNE/BREEDING LINES

- (A)I-Pr.121: Selection of improved strains of honeybees. 1973. R.H. Anderson, B. Buys

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- *W-Sb.75/: Bestryding van die Kaapse nagmuis, *Tatera afra afra*. 1964. S.S. Walters

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- 78/1: - Systematic study of the Diaspididae. 1963. Y. Bev-Dov
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- (S)WP.268: Beheer van skadelike voëls: Beheer van mossies met lokaas in hokke. 1980. J.D. Stadler

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BOSBOU/FORESTRY

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- (A)PS-Pr.45: Siektes van bosbome in Suid-Afrika:
- 45/1: - Roetine-ondersoek van siek plantmateriaal vanuit bosbouplantasies. 1975

- 45/2: - Opname van plant siektes in bosbouplantasies in die Republiek van Suid-Afrika. 1975
- 45/3: - Onderzoek van saailingsiektes in bosbouwekerye. 1975

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- (A)PS-Pr.37: Bakteriese siektes van akkerbougewasse:
- 37/5: - Roetine-identifikasie en moontlike beheer van bakteriese plantpatogene verkry van verskillende streke en institute. 1979. C.C.P.R. Deschodt
- (A)PS-Pr.43: Bakteriese siektes van kwarantynbelang in wingerd- en sagtevrugtekeukerye:
- 43/4: - Kroongal (*Agrobacterium tumefaciens*) van wingerd, kern- en steenvrugte. Chemiese en fisiese beheer van die siekte. 1979. J.T. Loubser
- 43/5: - Biologiese beheermaatreëls teen die siekte. 1979. J.T. Loubser, J.A. Thomson
- 43/6: - Voorkoms op verskillende gashere. 1979. J.T. Loubser

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STIKSTOFBINDING/NITROGEN FIXATION

- (A)PS-Pr.21: Studies met stikstofbindende bakterieë in Suid-Afrikaanse gronde:
- 21/21: - Bepaling van simbiotiese verwantskappe tussen verskillende genetiese lyne van *Medicago truncatula*. 1977. C.P. Snyman, B.W. Strydom
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- (A)PS-Pr.17: Identifikasie en klassifikasie van Suid-Afrikaanse swamme:
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- 17/2: - Eetbare, oneetbare en giftige sampioene en paddastoel van Suid-Afrika. 1973. G.C.A. van der Westhuizen
- 17/4: - Taxonomic study of the species of the genus *Colletotrichum*. 1978. A.P. Baxter
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- 41/3: - Studie van saadgedraagde swamsiektes van Japanse radyssaad en hul beheer in Suid-Afrika. 1975. M.A. Holtzhauzen
- (A)PS-Pr.57: *Phytophthora cinnamomi* in the Western Cape:
- 57/1: - Distribution and host range. 1977. Sharon von Broembsen
- 57/2: - Survival and spread in soil. 1977. Sharon von Broembsen

- 57/3: - *Phytophthora* root and collar rot of cultivated proteas. 1977. Sharon von Broembsen
- 57/4: - Occurrence and spread in rivers and other natural waters. 1977. Sharon von Broembsen
- (S)WI.71: Tandpyn van wingerd:
- 71/1: - Opname van faktore wat tandpyn kan bevorder. 1978. J.H.S. Ferreira
- 71/2: - Identifisering van siekteveroorakende organismes. 1979. J.H.S. Ferreira
- 71/3: - Laboratorium- en glashuisstudies insake chemiese beheer. 1979. J.H.S. Ferreira
- (A)PS-Pr.41: Studies oor saadgedraagde swamsiektes en hul bestryding in Suid-Afrika. 1975
- 41/1: - Fungus flora of onion seed. 1973. G.C.A. van der Westhuizen
- 41/2: - Voorkoms van patogene swamme op diverse plaaslik geproduseerde en ingevoerde saadmonsters. 1975. M.A. Holtzhauzen
- (S)N.141: Ekto- en endotrofiese mikorrisas van sitrus en subtropiese gewasse:
- 141/1: - Endogonaceae in die Laeveld. 1976. R. Mataré

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- (A)PS-Pr.42: Plantbeskermingmaatreëls teen kleingraansiektes:
- 42/1: - Nasionale waarnemingsproewe. 1974. J.N.W. de Jager
- (A)PS-Pr.59: Study of the diseases of some indigenous plants with weed potential and of exotic plants which have reached weed status in South Africa

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SKEIKUNDIGE ONTLEDINGS/CHEMICAL ANALYSES

- N-Ce.149: Development of soil, plant and water analytical services for Natal Region:
- 149/1: - Soil analysis services for fertilizer advisory purposes. 1978. S. Minnaar, I. Rottcher
- 149/2: - Herbage, animal feed analytical programme for research and extension. 1977. S. Minnaar, I. Rottcher
- (S)WP.223: Chemies/Fisies: Studies in verband met skeikundige en fisiese analitiese metodes:

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- (S)WP.145: Metodes vir die radiometriese analise van biologiese materiale en gronde:
- 145/11: - Analise van mengsels van radio-isotope deur middel van vloeistofsintillasie. 1978. Johanna F. de Villiers
- (S)WP.170: Reaksies wat toegediende plantvoedingstowwe in gronde ondergaan
- (S)WP.245: Radio-isotopie: Gebruik van radio-isotope in landbou. 1978
- 245/3: - Bepaling van molibdeen en scandium in gronde en plante deur neutronaktivering. 1978. W.A.G. Kotzé
- 245/4: - Scandium-46 en Gallium-67 as merkers vir aluminium in grond- en plantstudies. 1978. W.A.G. Kotzé

- 245/5: - Bepaling van grondvog en -digtheid naby die grondoppervlakte met behulp
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(S)WP.255: Reaksie wat toegediende voedingselemente in gronde ondergaan:
255/1: - Invloed van ionbalans op die opname en vervoer van kalsium deur appels.
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* Projek beëindig

* Project terminated

